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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

SCIENTIFIC AND INDUSTRIAL POLICY

AEROSPACE

FOKKER WANTS TO START NEW NETHERLANDS SPACE PROGRAM

Rotterdam NRC HANDELSBLAD in Dutch 7 Dec 83 p 11

[Article by Sjoerd van der Werf: "Fokker Is Looking for Openings in the Aerospace Market"]

[Text] The West European space laboratory Spacelab will remain of great importance to the Fokker plants in the future as well. Fokker had only a modest share in the realization of the Spacelab project (which had to do with the relatively small extent of Dutch financial contributions), but it was indeed an especially important segment: the scientific air lock in the "roof" of the laboratory, with which instruments could be temporarily put into free space for any and all purposes, and then retrieved.

"A vital element," thinks Paul Rouppe van der Voort, head of the marketing section of Fokker's aerospace division. "If the air lock fails, an entire Spacelab mission can be lost."

However, the air lock worked excellently, and will get another chance on the next Spacelab flight in November 1984. Rouppe van der Voort thinks that interest in the ingenious system--for which even experienced American aerospace technicians have displayed much admiration--will increase sharply after its success during the Spacelab I mission: "We have certainly had the impression that various potentially interested parties wanted just to wait and see how the thing would do in practice in space. Now they know!" Despite its complicated nature, the lock proved to be a thoroughly dependable component of Spacelab.

"Columbus"

At Fokker, the pleasant thought is already being cautiously tossed around that an air lock system such as the one in Spacelab could also be employed in future permanent space stations in orbit around the earth. This could involve an American space platform, but also an American-European cooperative project and even a completely European station, the first draft sketches for which have already appeared on the drawing board--and which are naturally still very noncommittal and tentative--under the project designation "Columbus."

Specifically, West Germany and Italy are big advocates of these Columbus plans, while the European Space Agency (ESA) has been studying similar possibilities for quite some time, which are likewise based on the Spacelab principle and as such can be set up so that they can be carried through in a European context as well as in cooperation with the United States.

In passing: in any possible new cooperation with the American agency for air and space flight (NASA), the European aerospace world will certainly see to it that a better agreement is reached than was the case with Spacelab, which, although completely funded by the ESA nations, is now entirely the property of the Americans, so that soon European researchers will simply have to pay the entire rental price for a coming mission.

Aside from that, the future of Fokker's aerospace activities does not depend only on the Spacelab air lock. Rouppe van der Voort: "Naturally, we have some more irons in the fire. Just take the temperature control system that we supply for various earth satellites (the Hipparcos star searcher, the ISPM [International Solar Polar Mission] sun scout and the Giotto comet scout) and our advanced solar panels, with which spacecraft are provided with electrical energy."

Fokker supplies solar panels for the European communications satellites (ECS), for British (military) Skynet satellites and for the large European communications satellite Olympus, which until recently was referred to as L-Sat. And in all probability it will not stop there. "Through our use of new materials and advanced techniques, our solar panels have, for example, become of interest to the American market and to satellites such as Unisat (England) and Italsat (Italy)," Rouppe van der Voort says.

Eureca

And then there is of course Eureca, ESA's independently functioning, unmanned space platform, which can be stationed in orbit around the earth by an American space shuttle, and which will only be brought back to earth a half year later during a later shuttle flight. Before Eureca can be taken on board again--the first launch is scheduled for 1987--it is important that the solar panels be retractile. Fokker and the West German firm Messerschmidt-Bolkow-Blohm (MBB) have presented entries, so that Fokker has in every respect a reasonable chance of getting ESA's order.

However, there is a "but." In financial terms, the Netherlands is still not taking part in this highly promising Eureca project, and if a decision does not come from The Hague in favor of the Eureca program before long, the commission for the solar panels will undoubtedly go to MBB. Without financial participation, one need not count on orders.

"Eureca and the solar panel project are of fundamental importance to us," says Rouppe van der Voort. "Aerospace activities still occupy a relatively modest place (about five percent of the total) at Fokker, but we are convinced that there are great growth possibilities. The only thing is, then we have to keep up with developments and keep in step with foreign

teams, which is--seen on a national level--even made rather difficult. The fact is, the Netherlands is clearly behind in aerospace expenditures in Europe, and that can have a very negative effect on our possibilities."

Support

According to Fokker, the government should in fact strongly support aerospace activities and, in so doing, bear in mind that aerospace travel cannot (yet) be solvent, but that the development of all sorts of new technologies is also of substantial importance in the area of aircraft construction. "A country like the Netherlands can't get a return on everything that it has invested," Rouppe van der Voort thinks.

"At the Ministry of Economic Affairs it has been said that the Netherlands must commercialize its aerospace activities, but over and above this it should indeed be realized that we really cannot yet fully pay our own way in this respect." Rouppe van der Voort is of the opinion that the compilers of the RAWB (Advisory Council for Science Policy) aerospace report took an insufficient look around at other European countries and at America, where the government--also proportionately speaking--provides much more support to aerospace projects than the Netherlands does. Examples? France spends no less than 42 percent of its aerospace budget on national projects, Italy even 50 percent. In contrast, the Netherlands is at 12 percent, and that percentage does still show a declining tendency.

Fokker--and at Hollandse Signaal the thinking is, broadly speaking, the same--finds it of primary importance that a new national (or bilateral) aerospace program be put back on its feet after ANS [Astronomic Dutch Satellite] and IRAS [Infrared Astronomy Satellite], simply because such projects are necessary to work one's way in internationally as well and to have the chance to be commercially active in the aerospace business. Although it is still strongly regretted that the government earlier cut the highly promising Tixte program--the construction of an observatory for the study of X-ray sources in the universe--it is certainly conceivable that in some circles the preference in a possible third project is not for one based in the astronomical (i.e., scientific) domain, but for one based on application--utility satellites, as the case may be.

TERS

Work has already been done for several years on plans for a special earth observation satellite for the tropics, the TERS (Tropical Earth Resources Satellite), in close cooperation with Indonesia. The earth observations to be conducted by TERS would, among other things, be able to play an important role in harvest predictions, forestry planning, combatting pollution, etc. in countries along the equator.

Within a few months, new talks will again be taking place between Indonesia and the Netherlands concerning the TERS project.

Rouppe van der Voort is convinced that there is a market for the Netherlands to capture in satellites like the TERS, which will be launched in 1992 at the earliest, as opposed to communications satellites, for example. "But," he says, "then they must get down to brass tacks on the governmental level quickly. There are opportunities in this domain, but if the whole thing takes too long, if decisions are simply put off, then someone else will perhaps be one step ahead of us, and this perspective market will be lost to us too, certainly if we want to aim for series production."

12271
CSO: 3698/191

SWEDEN'S KIRUNA MAY BE FUTURE LAUNCH SITE FOR SATELLITES

Stockholm DAGENS NYHETER in Swedish 2 Dec 83 p 26

[Article by Caj Noren]

[Text] Kiruna, Thursday--The Swedish Space Corporation is investigating the possibility of launching satellites of up to 500 kg from the Esrange rocket base outside Kiruna. It will mean a further strengthening of Kiruna's position as a European space center.

Current space activity alone is expected to employ 300 people in 1988--a doubling of the number of "space jobs" in Kiruna in 5 years' time!

According to Arne Helger, who heads the space center, it is completely possible even today to turn Esrange into a miniature Cape Kennedy.

"We currently launch sounding rockets with satisfactory safety, so it does not seem impossible to launch satellites to orbit the earth as well. That is why the Space Corporation has appointed a committee that is studying the economic and safety conditions."

Rocket Stages a Problem

Arne Helger feels that there is "every reason" to expect a future market for small inexpensive satellites as technical developments reduce the weight of the instruments.

On the other hand, there may be more difficulties in the matter of safety requirements. Among other things, this involves the question of where the spent rocket stages will drop back to earth.

"The entire project might be stopped if the rocket stages were to hit the ground in North America or northern Scandinavia. The plans to launch satellites are opening up even bigger prospects for Esrange. The space center is already operating as a receiving station for satellite data, and we are expanding our resources for analyzing the information. Esrange will also become a control center for the Swedish Viking satellite that will be launched in June 1985 and for the French-Swedish Sport satellite, which will be sent up in June 1985."

Small Satellites

The know-how at Esrange will mean big competitive advantages if it turns out that the space center can also launch small commercial satellites.

Esrange started out simply as a rocket launching base that was part of ESRO (European Space Research Organization). The Swedish Space Corporation was established in 1972, and it took over the operation.

Buying Transportation

It is primarily researchers from Europe, the United States, and Japan that come to Esrange to "buy" transportation to take their instruments into outer space over the North Pole.

About 60 people currently work at Esrange, and half of them are in the "rocket department."

So far, Esrange is receiving space data only from Landsat 4, the earth resources satellite. But between now and 1988, Esrange will operate (or will have operated) as a receiving station and control center for nine satellites, the reason being that as new satellites come into existence, the older, out-of-date ones disappear.

Viking in 1985

Next in line for launching are the Japanese Exos C satellite (February 1984) and the U.S. Landsat 5 (March 1984). In June 1985, it will be the turn of Viking and Sport, followed in December 1986 by Sweden's Tele-X, in 1987 and 1988 by the Japanese MOS-1 and Exos D, and in 1988 by the U.S. ERS-1.

It is believed that the big boom in activity for the Satellite Picture Corporation, which is the subsidiary in Kiruna, will come with Landsat 5 and especially the French-Swedish Sport.

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CSO: 3698/178

VIEW OF ARIANE COUNTDOWN PROCEDURES, KOUROU LAUNCH FACILITIES

Paris INDUSTRIES & TECHNIQUES in French 10 Sep 83 pp 74-83

[Article by special correspondent Alain Perez: "With the Ariane 'Mechanics'"; for related article see JPRS 84906 No 16 of this series dated 8 Dec 83 pp 5-7]

> [Text] As soon as the rocket has moved 1 cm, they lose any real interest in it. For them, the launching amounts to a deliverance, after 28 days of preparation and the agonizing 27-hour countdown. Our special correspondent Alain Perez spent a full week with the launch pad "mechanics." The launch pad, he said, is a gigantic assembly workshop and a giant service station at the same time. A place where all the talk is about pressure, flow rate, water hammer, temperature, degassing, corrosion.

Kourou, early August 1983. The sounds of the Guyanese night do not reach into the underground air-conditioned blockhouse. The launching center control room is circular. Some 20 m in diameter. The only way of access is closed by a heavy steel door controlled by a big black wheel. On the ceiling, the red figures of chronometer dials are stopped. An aisle goes all around the central room. On the other side, two printers record every operation. In the middle, all the console panels are pale blue.

Just above, 10 screens or so display grey pictures. On one of them, a forest of pipes. On another, a man dressed in a helmet and heavy protective clothing is working slowly. On a third one, you can see all of it. It is 60 m tall. Two hundred meters away from the blockhouse, the tower is lit. Outside, the evening air is hardly cooler and still as humid. It is 1 am in Kourou. The ground crew has just completed a tank fueling test. A full-scale simulation using nitrogen peroxide. New and more powerful pumps.

The white "4L" [expansion unknown] are coming back from the launch pad. A meal is waiting for them in the underground cafeteria. Tonight, they are about 20. Two km away, in a climatized building, the rocket is still enclosed in its air-tight containers. Its assembly will begin in two weeks. The seventh Ariane launch will take place in 1-1/2 months. "That place is a rocket-launching factory," we were told by Francis Pellacoeur, 31, who just directed the operation.

The ELA 1 launching facility is essentially a gigantic assembly workshop. It is also a giant service station with very special fuels. At the rate of one launch every other month, the Ariane mechanics are now involved full time with the European launcher. They are in charge of preparing the launch pad, servicing the spacecraft and releasing it before its final takeoff. "As soon as the rocket has moved 1 cm, it no longer belongs to us." A successful launch is the conclusion of a 27-hour countdown. Almost a routine operation for senior mechanics. Yet it involves over 500 procedures, close to 200 tons of propellants, several thousands of operations. The campaign lasts a total of 28 days. For a flight that will last just a little over 800 seconds.

The ground crew's responsibility stops as soon as the four anchoring hooks release the launcher. There is no red button to trigger the launch. The entire final sequence is automatic and synchronized. Yet it is not that simple, as it involves the handling of toxic nitrogen peroxide, highly explosive liquid nitrogen, and helium, which is an inert gas but costs a small fortune. Not to mention the 3,000 valves, most of which are manually operated, the hundreds of pumps and the few kilometers of stainless steel pipes. Add to all this the unavoidable leaks that must be detected and repaired immediately. Even if it means working directly on the launcher already filled with propellants, after the countdown has begun. You have to keep cool to unjam a valve clack at the foot of what amounts to a bomb. Even if you are accompanied by the firemen, the "guardian angels," and their respiratory equipment. The seconds tick away. Sometimes, you hear a discreet and disturbing "ding dong." It announces that the computer has just stopped the current procedure. "Go over to manual." You must then watch still closer the pressure gauges on the control panels.

A 2-Hour Launch Window

The payload is at the very top of the L7 launcher, 45 m above the ground. It will be loaded 10 days before launching. This time, the payload is the Intelsat 5 telecommunications satellite. This is Ariane's first true commercial payload. The satellite was built by Ford Aerospace in California.

During the launching, this delicate marvel is protected by a nose cone which, as could be expected, was manufactured in Switzerland. This satellite is a technology concentrate that costs 280 million francs and weighs 1,834 kg. That is 150,000 francs for each kg of electronic equipment and solar sensors. If the launching is successful, the satellite will be amortized in... 12 months.

The satellite cannot wait. It must be launched within a 120-min launch window. If the launching is delayed too long, it will then have to wait another 24 hours. Then, the third stage must be emptied of its cryogenic propellants, liquid hydrogen and oxygen. Even with complementary refueling, these cannot wait more than six hours. Worst still, if the four first-stage engines are fired and their measured thrust found insufficient after 3.4 seconds of combustion, the computer will block the hook release. The engines will be cut off. The launching will be aborted. "At the time of the first launching, in December 1979, we had four postponements and one aborted launch. We were scraping the bottom of the propellant tanks. Then, we had a computer failure 12 seconds before takeoff. When the rocket finally took off, we were so relieved that we did not even pay attention

to its flight." At the ELA 1 site, there are no path calculations, and no weightlessness problems. Here, people are talking pressure, flow rate, water hammering, temperature, degassing or corrosion.

190 Tons of Propellants

A rocket consists essentially of fuel and oxidant. On board, of course, but much more still on the ground. A launcher with an empty weight of 20 tons will thus carry 190 tons of propellants. The 4 first-stage engines will consume close to 1 ton of propellants per second, for 150 seconds.

The first two stages (L140 and L33) are using UDMH (unsymmetrical dimethylhydrazine) and nitrogen peroxide (N_2O_4). When they come into contact, these two liquids explode spontaneously. The third stage (H8) includes two tanks with a single bottom. One and a half tons of liquid hydrogen (LH_2) and 4.5 tons of liquid oxygen (LOx). There is also helium gas to clean up the cryogenic lines and nitrogen for the lines of the first two stages. Six fluids, of which two are highly toxic (UDMH and N_2O_4), one very dangerous (LH_2) and another one horribly expensive (He). They are all stored less than 100 m from the tower, in separate areas. The LH_2 and UDMH tanks are protected by blast-resistant walls.

"Before each campaign, we get enough supplies to allow five launching attempts, one aborted and one successful flight," we were told by Gaston Rabeau, a pioneer of the Ariane adventure who is in charge of ground operations. This means 291 t of N_2O_4 (2 x 100 m^3), 156 t of UDMH (2 x 100 m^3), 150 m^3 of LH_2 and 40 m^3 of LOx. "We are supposed to be safe in our blockhouse. But no one is absolutely sure of it."

Only liquid oxygen and nitrogen are produced in Guyana by an Air Liquide subsidiary. Everything else comes from France (LH_2 and N_2O_4), the United States (He) and... the Soviet Union. The latter will still supply the precious UDMH for a short time at the highly competitive price of 45 francs per liter. "At first, we were quite surprised to find out that the Russian UDMH was better and twice cheaper than the U.S. UDMH. We ordered 900 t at once." For several years, and maybe without knowing it themselves, the Soviets were the sole suppliers of fuel for the first two stages of Ariane. Recently, SNPE [National Powder and Explosives Company] started producing this propellant in Toulouse, by its own process. Although the French UDMH is much more expensive (75 francs per liter), it will now be given preference for obvious reasons of supply. The same is not true of helium. It is produced exclusively in the United States and costs 18 francs per liter, including delivery to Kourou (at 0°C and 1 bar). This fluid is irreplaceable. It is the only one that does not form ice plugs with liquid hydrogen (20°K). The Japanese, who are plunging headlong into cryogenic propulsion, keep their lines permanently under hydrogen and do not use helium. "They are crazy, even the Americans dare not do that."

Helium is used to clean up the LH_2 and LOx pipes, and also for the flight pressurization of the third stage.

30 Years Old and Already a Veteran

The launcher thus carries a sphere of 150 liters of helium at 200 bar and 90°K. The expanded helium is used to put the LOx tank under pressure during the whole third-stage combustion (10 min); it is also used to provide the initial LH_2 pressure. As soon as the third-stage is fired, the liquid hydrogen is pressurized by hot nozzle gases. But the essential use of helium is to clean up the pipes before liquid hydrogen is let in. Successive compression-expansion cycles are used to clean up the pipes to meet specifications: less than 5 vpm (volumes per million) of water, 10 vpm of oxygen and 20 vpm of nitrogen. The liquid oxygen system is purged in the same manner. "In the case of oxygen, we could use nitrogen to clean up, but there are mixing problems between the two gases."

All these delicate fluids are handled by the fuel men. Theirs is probably the hardest job in Kourou. Working in a dangerous atmosphere at over 30°C, they must wear a special suit weighing 10 kg or so, with an attached helmet. They are the ones who connect the "boas," the hoses used to fuel the launcher, who watch as the "jerricans" (tanks) are being filled, and go repair the leaks. At the launching center, the security crew follows the operations on TV screens. Ten fixed and 5 adjustable cameras are watching the 8 platforms of the tower. "Why is he not wearing his gloves?" But fuel men have nerves of steel and a tough skin. "UDMH and N_2O_4 are truly 'foul stuff.' But if you must tighten a nut, it is quicker without gloves," Jean-Paul Bresson, 30 and already a veteran of the trade, told us quietly. On each of the tower platforms, a shower is ready for use. The fuel men receive an additional bonus of 25 francs per hour when they wear their special suits. Daniel Billard, 30, has been at Kourou for 2 years. He holds a higher cryogenic technician diploma (from Toulouse) and is naturally in charge of the third stage control panel. The fueling operation is scheduled to last 58 min. It begins 2 h 25 before H-hour. The first and second stages have been filled about 10 hours ago and the tower removed. The LH_2 tank (22 m^3) is above the LOx tank (5.5 m^3). They have a common bottom made of honeycomb under vacuum between two skin layers; it is curved downward. After cleaning up and cooling the lines, oxygen fueling begins; it also cools the hydrogen tank. To preserve the shape of the bottom, the hydrogen pressure is always higher than that of the oxygen (by 300 mbar). "Actually, it is simple; it is a hit or miss system. You open a valve and you wait. When the level is reached, you add the fuel complements." The evaporation of the two propellants is automatically corrected within two values. The cryogenic system includes 100 remote-controlled and 300 manual valves. The launching center data-processing system is simple. Two good old Mitra 15 that are not very fast, which is not much of a problem, but that are chockfull of data. The first one (K1) is in charge of electric systems, pyrotechnic control and telemetry. The second one (K2) is in charge of all fluid systems. The two computers are watching each other. The K1 computer is also in charge of transmitting the flight program to the launcher. The sealed tape containing the data (rocket path) is remote-loaded 50 min prior to firing.

Somewhat Superstitious

The measuring equipment is more impressive. Some 20 control racks including the famous APL (release-step controller). A small and insignificant box some 30 cm high, containing a few electronic boards. Actually, it is a sequencer which takes over 15 seconds before takeoff. It controls the retraction of the cryogenic arms

from the mast at H-4 sec. It also controls the opening of the hooks at H+3 sec if the thrust is adequate. "We have two interchangeable APLs. We are somewhat superstitious. Until now, we always used No 2. Except the last time. It failed the day before the countdown. With APL 1, it worked just as well," we were told by Joel Ruaud who took part in all the launchings since the beginning. "During the first launch, a minute explosion destroyed a sensor. The APL refused to validate the start, although the thrust was adequate. We had an aborted launch. One full week working around the clock. Now, we have two sensors. The propellant pressure at the focal point is adequate to decide whether the engine is all right."

The cryogenic arms and the vertical test stand are two other critical points. The former are tied to the mast and are used to supply the third stage after the tower has been removed. They do not play any part in supporting the launcher. They were developed by Latecoere. The vertical test stand dates back to the Eldo program. For the old hands, it still brings back bad memories of the Europa rocket. Twelve launches, 12 failures, including one at Kourou. The test stand includes four trunnion hooks which support and release the launcher. This, too, is a simple and robust mechanism. A combination of hydraulic jacks and prestressed washers. The total stress on each trunnion is 43 tons.

Within 300 Milliseconds

The filled launcher has a mass of 210 tons. Its takeoff thrust is 250 tons. That is, in principle, a vertical force of 40 tons. Or 10 tons per hook. The first step is to remove the hydraulic constraint (26 tons per hook). When the launcher thrust exceeds the effort of the compressed washers, the hooks are toppled. It all occurs within 300 milliseconds. The four releases are synchronized within a few thousandths of a second. "It is an elementary mechanism that works well," we were told by Francis Pellacoeur, who is in charge of the test-stand arms. Prior to each launch, the hooks are protected by a white heat-resistant coating containing silica and asbestos. Opposite hooks contain the first-stage propellant inlets (nipples). At H-4 sec, the arms slowly start moving away from the launcher. At H-0, the arms are fully released. Only clack-valve plates are still connecting the launcher to the mast. They will be torn away at takeoff, 3 sec later. "Until now, the launching delays we have experienced were due to the satellite launcher. Not to the launch pad."

The tower itself is a factory. It protects the launcher until the third stage is filled with fuel: H-6 h. It includes eight removable working platforms. The last one (PF8), at the satellite stage, is a white room (class 100,000), with a tunnel and reserved access. An elevator stops at all levels. At motor stages, the ambient air is sampled and analyzed by detectors (helitesting, ion-tracing, chromatography). During the countdown, all these data are transmitted to and recorded by the launching center. At third-stage level, in particular, the presence of oxygen and hydrogen in the skirt is measured. If concentrations exceed 5 percent (which occurred at the time of the LO2 launch), sweeping, i.e. forced air ventilation, is stepped up.

Little room is left in the ELA 1 tower. Two recently installed bracket cranes are being tested. They will be used to position additional powder-propellant

boosters on Ariane 3. The first launching of this more powerful version (2,380 kg of payload) is scheduled for June 1984. The two 7-ton powder-propellant boosters will switch on when the rocket has covered 10 m or so. "Two nice blow-torches. The test stand and the mast will suffer somewhat greater damage."

The campaign starts with a technical assessment. It is a technical review of the launch pad which is supervised by the head of operations at the launching facilities (the COEL). Some 50 people or so are present. Among them, the COEL for the next three launches, Mathias Trotin, from the CNES [National Center for Space Studies] in Evry. And for the first time, the client: Allan Mac Caskill, representing Intelsat. His presence is said to have subdued the discussions, which are usually more lively.

A Single Boss

During that day, changes are submitted to the COEL. In one day, he has become the single boss of a team of 80 people, all chosen by him. "The COELs do not like to see newcomers at the launching center." He is assisted by six experts, including the ELA assistant in charge of all ground facilities. For the first time on 15 September, Francis Pellacoeur will assume this part. Gaston Rabeau, ELA assistant during previous launches, will become "parachute." He will keep himself available in case of need. He knows the ground equipment inside out.

The atmosphere during the technical assessment is also different. It is courteous but more formal. The familiar style which usually prevails at the launching center is toned down. "When Paris officials arrive at the start of the campaign, they take over the launch pad," a veteran told us.

Between the June and the September launchings, half the procedures were altered and validated: 270 changes out of a total of 533 procedures. Each change is supported by a FASO (Operation Analysis and Follow-Up Sheet). "I signed 800 FASOs in one month," F. Pellacoeur confided. Finally, the COEL approved the setup. Just then, a big russet cloud of nitrogen peroxide rose slowly above the tower. "They degassed without looking at the temperature gradient."

Two General Rehearsals

A campaign lasts 28 days and ends up with a 27-hour launching countdown. The campaign starts with the installation of the launcher in the tower. First, the first stage on J-27 days. The second stage is assembled starting on J-25 days.

These two assemblies are carried from Les Mureaux to Kourou by barge, ship and road. The third stage is erected on J-22 days. It is carried by air. On J-18 days, the three assembled stages are checked for tightness. The first-stage fins and fairings are installed from J-15 to J-12. On J-8, there is a general rehearsal of the launching countdown. It simulates actual launching (down to H-12 sec) and includes filling the third stage with propellants. The first two stages remain inert. The payload and the protective nose cones are hoisted four days before takeoff. After a new general rehearsal (J-3 days) and a launching aptitude review (J-2), the countdown proper starts. During all this stage, the launching center staff (120 people, 80 of whom are operational) remains in the blockhouse.

They take their meals on location, and 10 beds or so are available in the basement. Between H-25 h 30 and H-21 h 45, the N_2O_4 tanks are filled, first those of the second stage, then those of the first stage. Between H-18 h 30 and H-14 H 30, the UDMH tanks are filled (first stage first). The starting rate is 7.5 m^3/h. It then increases to 35 m^3/h for the second stage and 70 m^3/h for the first stage. Filling of the third-stage tanks (LOx then LH_2) starts at H-3 h 20. As soon as the tanks are filled, the helium sphere pressurization begins and complementary tank filling takes place. At H-10 min, all telemetry reports must be green. The countdown sequence starts at H-6 min. The launching center has a master clock which allots time. Starting at H-4 sec, the APL takes over and controls the opening of the arms. At HO, the four first-stage engines are fired. The two computers assess the engine thrust. The hooks open as soon as the design thrust is reached (between H+3 and H+4 sec). The launch pad is then replaced in a security configuration (3 h). The very next day, the launch pad revalidation starts. The present record for the overhauling of the ground facilities is 11 days. As soon as the rocket leaves the ground, tracking stations take charge of it. Kourou, Montagne-des-Peres, Cayenne, Natal, Ascension. All data are transmitted to the Guyanese space center (CSG), 13 km south of the launch site. This is where the flight security staff may decide to destroy the launcher if it does not follow the right path.

In the special building reserved for satellite assembly (S1), Allan McCaskill is pleased. "The facilities are good. So is the launcher. This is my 40th launch, but I am always a little nervous before a launching. One bad weld and you have a 60-million-dollar loss." The satellite is being assembled in a white room. All are wearing white coats and caps. Some 30 people from Intelsat and Ford Aerospace are checking the satellite operation. They have come on a Boeing 747 cargo plane full of equipment (55 tons).

With ELA 2, One Launch Per Month

The new launch pad (ELA 2) now being built is still more immense. Twenty km of pipes, including 1,200 m under vacuum, 35,000 m^3 of concrete, 1.8 million units of refrigeration ["frigories"], 5 ha of formwork. It will be placed in service in 1985. Thanks to ELA 2, it will be possible to provide one launch per month using the Ariane 4 version (over 3 tons of payload). It will also establish the young Arianespace company which will gradually become the owner of the launching center.

One major difference with ELA 1: the launcher assembly and firing areas are entirely apart.

ELA 2 consists of two major parts: one rocket-assembly yard, and one launching tower with its umbilical mast. The two are 800 m apart and are connected by a travelling table circulating on a double railroad track. That way, it is possible to start assembling one rocket while another one is being prepared for launching. At ELA 1, the launcher is erected in the launching tower.

After assembly, the empty launcher is carried standing on the tractor-drawn launching table. Thanks to a switch, a second launching table is then sent to the assembly yard for another assembly, and so on. ELA 2 is truly a rocket-launching factory.

At present, civil engineering work is being completed. "The total budget is close to 800 million francs over 4 years," we were told by C. Tinturier of the CNES, who is following the work. "At ELA 1, we are restricted to five launches per year. With ELA 2, we are going from the prototype stage to the series." The assembly yard (70 m high) is sheltering the launcher minus its payload. The new launching center nearby (CDL 2), is itself 900 m away from the tower. It will become easier of access and security procedures will be simplified. The travelling table costs 40 million francs. It was designed by the German company Augsburg-Nuernberg Machine Factory and travels along two French-railroad type tracks 12 m apart. Between the tracks, a 350 hp tractor pulls the table. The maximum load that can be carried by the device is 550 tons. The righ-angle switch rests on an air cushion. It was developed by Bertin.

The new launching center is of course more modern. The console panels have been reduced to a minimum and replaced by screens. But only secondary data will appear on the displays. "People like to see directly on a panel what is going on." The data-processing system, too, has changed. A Mitra 15 is still used for electric controls, but a decentralized system including over 500 microprocessors and a Rovsen (Denmark) computer is used for the fluid system. The whole data-processing station is worth 120 million francs. The release system and the cryogenic arms are practically identical (100 million francs). These equipment budgets appear modest compared to the civil engineering budget, which represents the lion's share: 350 million francs. The latter covers a detour of the RN 1 highway (Cayenne to Saint-Laurent-du-Maroni) which otherwise would have gone right through the launching site. Here, all are waiting for the first ELA 2 Ariane launching. And especially for the arrival of the first tractor driver that will pull the rocket standing on its launching table. He is due to arrive soon. He is being trained in the FRG.

At ELA 2, the assembly time of a launcher will be about equal to a campaign. One month for each operation. It takes one week to assemble the three stages, plus three weeks to check the assembled launcher (for tightness). At the tower, it takes also one month to revalidate the launch pad after a launching and to prepare the new launcher (revalidation takes 11 days). If the two operations are properly synchronized, one Ariane rocket should take off from Kourou every month starting in 1986. Progressively ELA 1 will be abandoned. This means that the personnel will increase by 50 percent and that the crews will become interchangeable. "After three campaigns in a row, you really need some rest."

Knowhow Transfer

This personnel problem is precisely one of the concerns of Daniel Erard, director of the Arianespace Kourou facilities. "Actually, there is a little core of experts whose knowledge is indispensable. It is a tricky situation when you want to provide commercial service. But we are implementing methods that will force these experts to transfer their knowhow. The technical assessment is one example. You learn a lot during a technical assessment. But all the knowhow is not recorded in procedures."

For the time being, the Ariane project still has a taste of adventure. The tropics, wide open spaces, an informal atmosphere. Here, availability and versatility count double. It is an adventure that not all like. The average age

is 30, but few renew their 3-year contracts. Those who want to make a career in the space industry prefer being salaried employees at Arianespace or the CNES. The others, temporarily delegated by COMSIP [expansion unknown] or SODETEG [Technical Studies and General Enterprises Company], are waiting to go back home. There are as many status and wage scales as companies involved. Some complain about the social life, others enjoy the sea, which is warm all the year round. "We are dealing in space because it is a marketable product. By the end of 1984, I will have hired some 100 technicians. But our problem is to achieve reasonable costs. We have clients now. It is no longer the taxpayers who are paying," Daniel Erard concluded. At any rate, without all these technicians, fuel men, mechanics and data-processing experts at Kourou, beautiful Ariane would only be a lifeless spacecraft. Like a Rolls Royce which has run out of fuel in the Amazonian forest.

PHOTO CAPTIONS

1. In the launching tower, eight removable platforms enable technicians to work on all stages. An elevator connects all stages. /Caption for picture on left, p 76./

2. Each hook applies a 43-ton force on the launcher. When the launcher is released, the jack forces are removed first. The launcher is released when its thrust exceeds the residual force. /Caption for picture on right, p 76./

3. Fueling tests take place on capacities. Preparation of a nitrogen peroxide flow test at the second stage. /Caption for picture on left, p 77./

4. The fuel men are truly pump attendants for the rocket. They install the fueling "boas" and supervise the fueling operations. /Caption for upper right picture, p 77./

5. Arrival of nitrogen peroxide at the second-stage engine level. This is the first operation in filling the launcher with propellants. (A. Perez's documents) /Caption for lower right picture p 77./

6. The launch pad and the tower include some 3,000 valves; 90 percent are manual. /Caption for picture p 78./

7. The cryogenic arms supply liquid hydrogen and oxygen to the third stage. Four seconds before the first stage is fired, they are automatically disconnected from the launcher. /Caption for picture p 79./

8. Bracket cranes are used to install powder-propellant boosters on the more powerful Ariane 3 version. Each booster weights 9 tons, including 7.5 tons of powder propellants. /Caption for picture on left, p 80./

9. The launching center. In the left foreground, the console of the COEL (head of operations at the launching facilities) who is the launching boss. Right, the ground safeguard console. /Caption for top picture pp 80-81./

10. The cryogenic stage. The most delicate point of the tower. Liquid hydrogen and oxygen circulate through the flexible pipes. The lines are first cleaned up with helium gas. /Caption for lower right picture p 80./

11. At the launching center, some 20 control racks are used for telemetry and parameter recording. Everything is recorded during the 27-hour countdown. /Caption for upper right picture p 81./

12. The Intelsat 5 satellite is being checked. It will be launched on 5 September. It has a capacity of 12,000 telephone communications and 2 TV channels. /Caption for lower right picture p 81./

13. The satellite is assembled in a special building (S1). It costs 35 million dollars, 10 million dollars more than the cost of the launching. /Caption for picture p 82./

14. The new ELA 2 launching pad under construction. A removable table will be used to transfer the rocket standing on tracks. From the assembly hall to the launching tower. /Caption for picture p 83./

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AUTOMOBILE INDUSTRY

SAAB CLAIMS WORLD'S MOST MODERN ENGINE-ASSEMBLY PLANT

Stockholm NY TEKNIK in Swedish 13 Oct 83 pp 30-31

[Article by Ulf Bergmark]

[Text] The engine for the Saab 99 and 900 is assembled in one of the world's most advanced assembly plants. Robots do the heavy lifting and the time-consuming screw driving.

The plant may become a golden egg for ASEA [Swedish General Electric Corporation], which subsidized Saab-Scania's development of it. The reason is that ASEA can sell the advanced assembly technology to Saab's competitors.

Nine out of 10 workers at the gasoline engine plant in Sodertalje are women. Assembly work has traditionally been viewed as "lighter" work. But that is only partly true. Heavy lifting and such monotonous tasks as driving screws take their toll on the body and lead to aches and absences due to sickness.

Only robots and automation can take over the heavy jobs.

So say Lars-Goran Johansson, Stellan Hahlin, and Bjorn Biskop, the production experts responsible for the operation. Together with the union, the company health department, the industrial truck manufacturer (Construction and Transportation Economy), and a few other Swedish firms, they have developed the world's most advanced engine assembly plant.

Old Equipment

The reason for doing so at this particular time was that the old equipment in the engine plant was on its last legs. Production had to be increased, and it would not have paid to add to an old technology. The Scania Division, which builds the engines, therefore invested in something entirely new.

It is too early to say whether the working environment has become that much better in comparison with the old team assembly system. The plant has only been in operation since the summer vacation.

More Uniform Production

On the other hand, it is clear that automation can provide more uniform production and quality. Thanks to automation, all components can be tested before the engine undergoes its final road test. One example is the machine that drives screws in the cylinder heads. It shows values for the torque and torsional angle of each screw.

Over a period of 5 hectic weeks, the old equipment was ripped out of the gasoline engine plant. The floor was torn up, and tracks for the loop-traveling transporter trucks were poured. The equipment was installed and tested.

Robots Are Cheap

Robots are cheaper than large special machines. Automation cost only a little under 20 million kronor. That is the price of six robots, two so-called taxi trucks, and 35 assembly trolleys.

The robots are also flexible. It is easy to make changes when production runs are short, and that is a vital argument in their favor, since Saab-Scania is one of the world's smallest manufacturers of passenger cars. About 30 variants of the engine are currently being produced, and this means that each engine type is produced in relatively very small batches.

Ten small computers control their own portions of the assembly process. There is no large computer overseeing the operation as a whole. This makes it much easier to break the system in and also makes it much easier to change if, for example, any of the stations needs to be expanded.

Not Big Enough

The big problem at the moment is that the plant is not big enough. The production ceiling of 100,000 engines annually has been reached. When reconstruction began to be sketched out a few years ago, annual production was 70,000 engines.

If demand for the Saab 900 rises rapidly, plant management will either have to get union approval for starting a night shift or expand rapidly. An expansion is planned for next summer.

So far, automation has not caused anyone to lose his job. The robots have simply taken over the increase in production.

The plant is not a secret, even though it is so advanced. Visitors are beginning to be allowed in. Those most eager to come and have a look are auto manufacturers from other firms.

Stellan Hahlin says: "There is a gentleman's agreement among auto manufacturers. We learn from each other when it comes to production engineering."

Hard To Plagiarize

"We are not particularly afraid of industrial espionage. Each plant is tailor-made. Anyone who thinks it is possible to plagiarize is mistaken."

Saab-Scania has neither the resources for nor an interest in selling its production engineering to its competitors. It is primarily ASEA that may make money from the new assembly system.

ASEA has already sold industrial robots to a number of auto manufacturers around the world. Volvo and Saab-Scania, for example, have welding robots, and so do Mercedes, Audi, and General Motors and Ford in the United States. West German Ford uses ASEA robots to remove burrs from castings. BMW also has ASEA robots, and GM in Australia uses the Swedish robot to cement windshields.

Saab-Scania accepts the idea that its own plant will be a demonstration plant for ASEA, because ASEA assumed a great deal of the total responsibility for the project.

On the other hand, there is great annoyance at the fact that an advanced tool for installing valve keepers has been patented by ASEA. Saab technicians were the originators of that tool and participated in its development.

Winner for ASEA?

ASEA says that the tool was developed by ASEA at Saab-Scania's request and that all ideas come from ASEA.

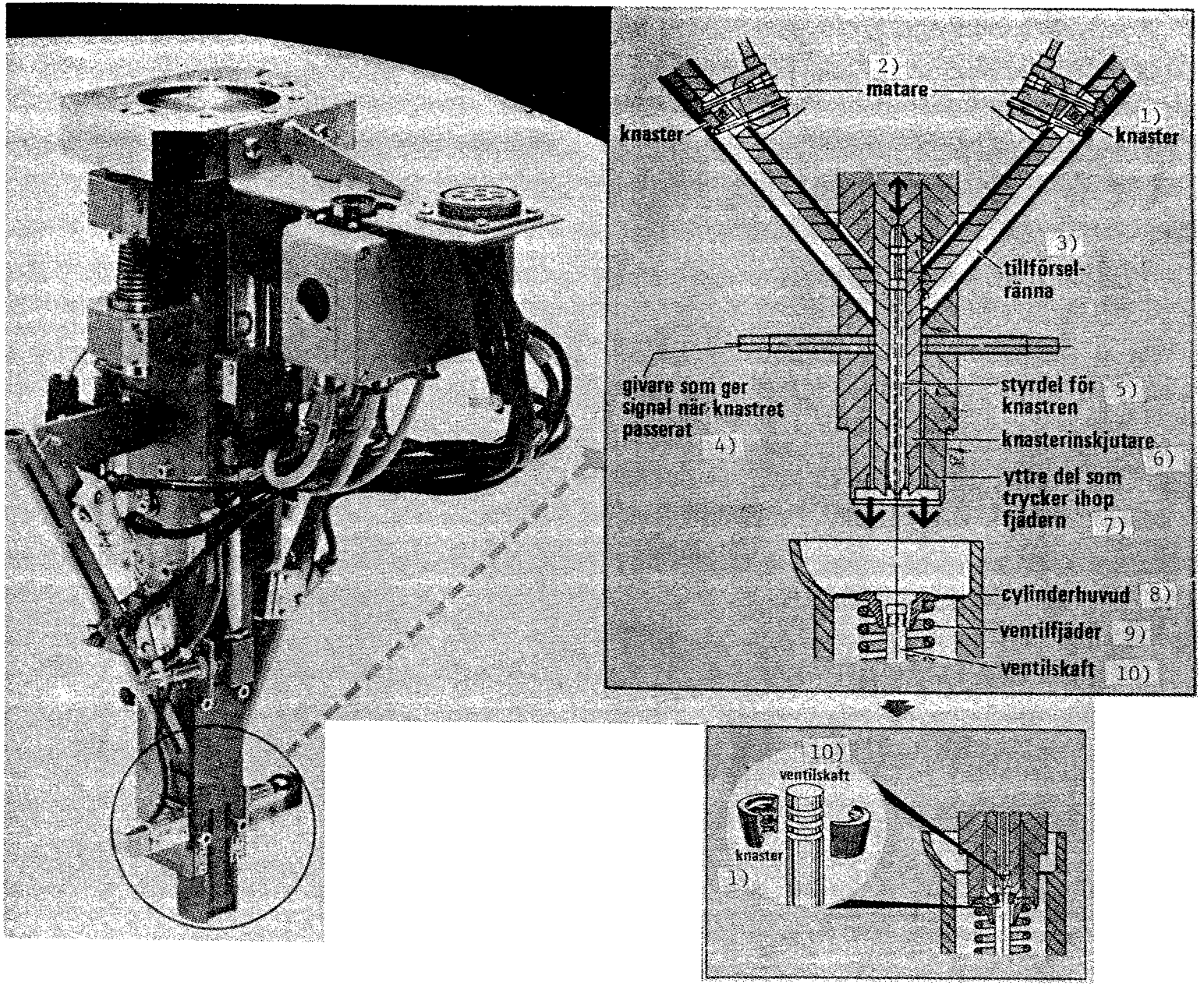
The installing tool, which is described below, may become the real winner for ASEA, which manufactures it, since the tool makes it possible for the first time to rationalize the very time-consuming assembly of valves in cylinder blocks. The trend is toward energy-efficient engines with 16 valves instead of the current 8 in a four-cylinder engine. The greater number of valves will quickly make it profitable to replace a worker with a robot.

[Caption and key for illustrations on the following page:]

The small valve keepers shown in the lower right-hand drawing are installed with a very advanced tool. The large drawing shows how the tool compresses the valve spring so that the keeper can slide into place. A keeper is a sort of locking ring that holds the spring on the valve.

Key:

1. Keeper
2. Feed
3. Feed channel
4. Sensor that signals when the keeper has passed
5. Keeper guide
6. Keeper chute
7. Outer piece that compresses the spring
8. Cylinder head
9. Valve spring
10. Valve stem


2)
matare
knaster
1)
knaster
3)
tillförsel-
ränna
givare som ger
signal när knastret
passerat 4)
styrdel för
knastren 5)
knasterinskjutare 6)
yttre del som
trycker ihop
fjädern 7)
cylinderhuvud 8)
ventilfjäder 9)
ventilskaft 10)
10)
ventilskaft
knaster
1)

Automated Birth of a Saab Engine

The engines travel through the new plant as though following a marked trail.

Manned stations alternate with automated stations where robots do the work.

The setup represents a breakthrough for automated assembly. Robots that weld and spray paint and those that inspect constitute a well-established technology with most auto manufacturers.

Automated assembly using robots is considerably more difficult, since it involves fitting together components that not only vary in size but also may be oriented somewhat differently on the conveyor belt.

Coping with those variations requires very precise positioning and many sensors to give the signal when something goes wrong. It also requires large computer capacity.

Between each two stations at Saab-Scania's engine plant is a temporary storage area. That is important if things get jammed up.

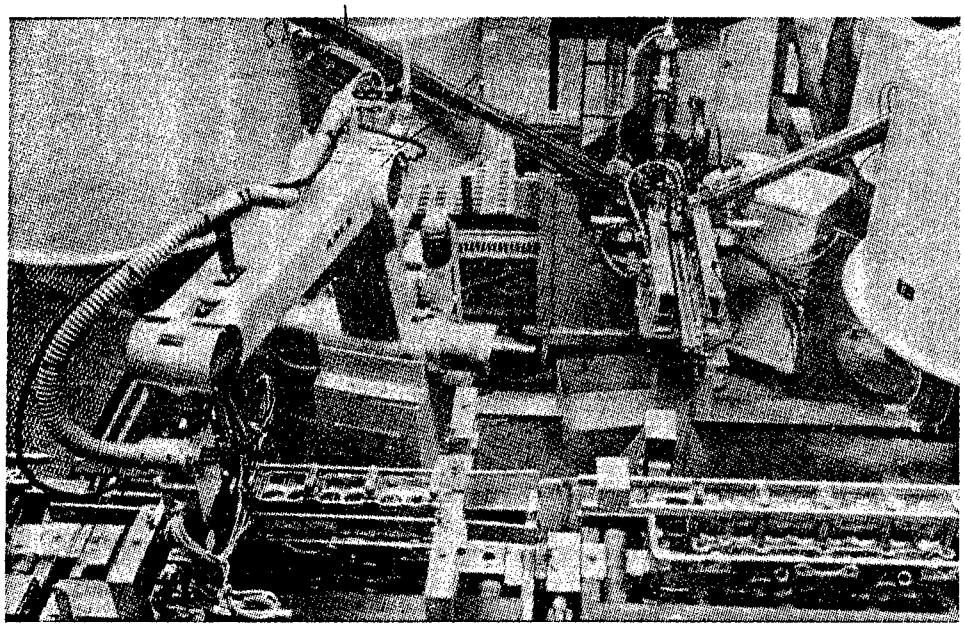
It also means that the assembly workers can work at their own pace.

The production experts will probably not be satisfied with six robots in the assembly process.

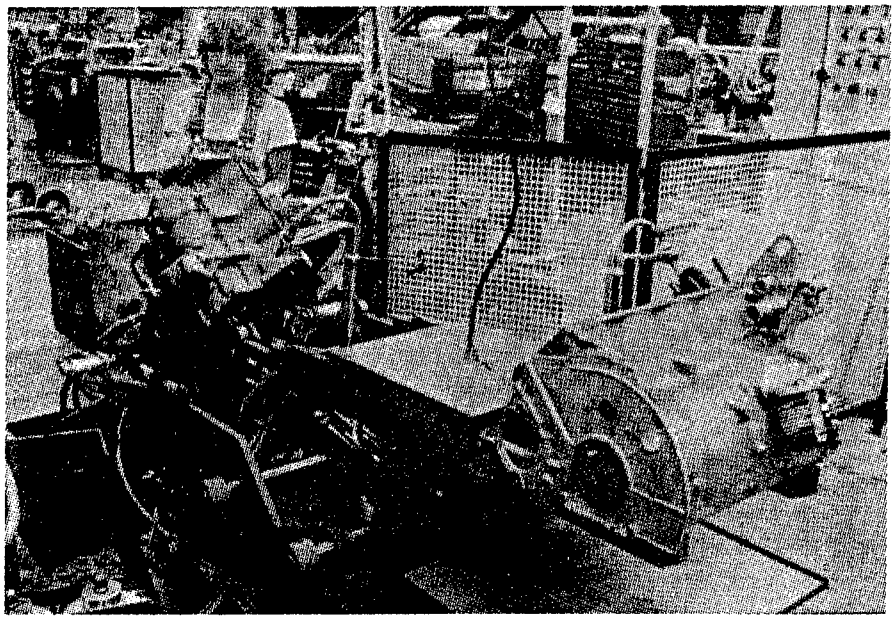
More complicated assembly jobs can be done by robots that "see" with the help of a TV camera and robots that "feel" with sensors in their grippers.

The technology for "feeling" has advanced farther than that for "seeing" and is a more likely possibility when the plant is expanded the next time.

> Step 1 [see photo on following page]: The most exciting solution is that for installing valves in cylinder heads, a time-consuming job that has been hard to automate, but automation is a necessity now that Saab is coming out with a 16-valve engine.
>
> The valves are set in place manually. This is done quickly, so there is no advantage yet to automation. After that, the cylinder heads are inverted and taken to the first robot. The robot puts the valve springs and washers in place. Vibrating and centering feeders combine two washers and one spring into an assembly that the robot can grasp with a gripper which can hold six spring assemblies.
>
> The next robot compresses the spring and places two valve keepers on it. The very small keepers (only 10 grams) hold the spring tightly against the valve. This job requires a large industrial robot, since it requires a force of 740 N (about 75 kp) to compress the spring so that the keepers will fall into place.



Step 1



Step 2

The assembling tool also measures the height of the top washer. If a keeper is seated incorrectly, the height of the washer is changed. In such a case, the cylinder head is removed from the line automatically for adjustment.

Step 2 [see photo on preceding page]: When the engine block is received from the machining department, the first items to be installed are the crankshaft, main bearings, and pistons. This is done manually on a conventional assembly line. After that, the new technology takes over.

A driverless truck distributes the engine blocks to four manual stations where gaskets, end plates, timing chain, and gear case are attached.

This part of the assembly goes quickly, and the truck arrives soundlessly to take the engine blocks away. They are set on a platform--a little trolley on which the engine rides further on the roller conveyor.

Step 3: Two robots then screw down the end plate and gear case, each of which is sitting on its short end. The first is tightened down with 13 screws of two types, the second with 10 screws of four types. The correct screws are fed to the robot automatically.

If a screw does not go in as it should, the robot presses a lever on the platform to indicate that something is wrong. If trouble occurs on three engines in succession, the line stops.

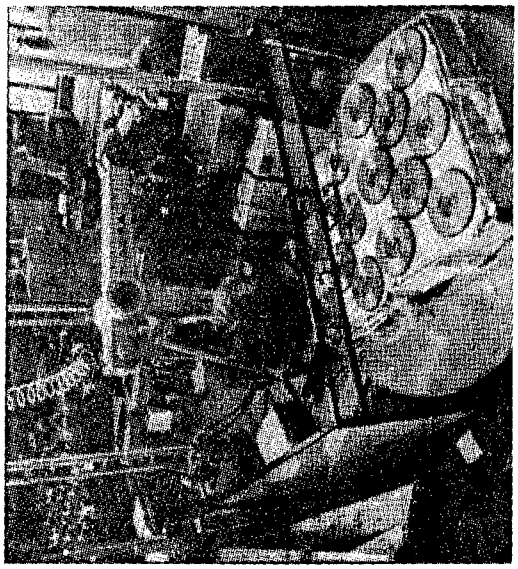
Step 4 [see photo on following page]: The cylinder heads are lifted onto the engine blocks. A robot steps in and inserts the 10 screws holding the engine together.

The screws are tightened down by a computer-controlled screwdriver. All the readings are recorded on tape, and if a screw offers resistance, the computer sounds a warning.

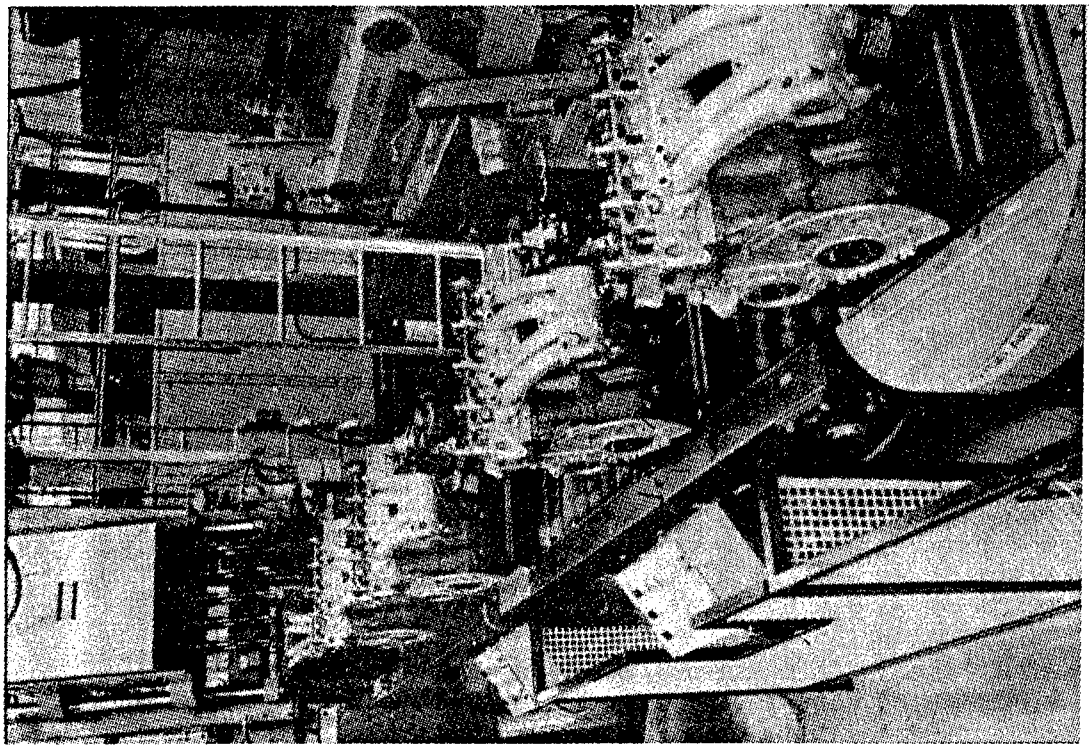
Step 5 [see photo on following page]: One of the heaviest jobs before the robots took over consisted of attaching the flywheel to the crankshaft.

Now a robot not only sets it in place but also drives in the screws.

Flywheels are delivered on pallets by a subcontractor. The robot picks out the flywheels one by one, grasps them with a three-fingered gripper, and sets them on a positioning station, where it locates the guide pin for setting the timing.



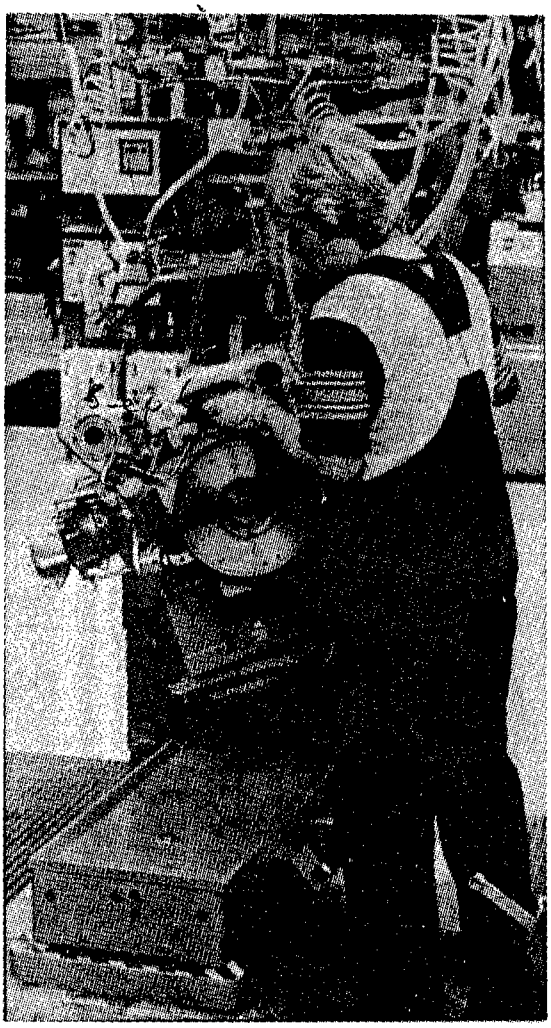
Step 5



Step 4

The robot then picks up the flywheel again and hangs it on the crankshaft.

The robot then exchanges its gripping device for a screwdriver that feeds in the right kind of screw and tightens the seven screws.



Step 6: Lastly, the engines are placed on track-controlled trolleys that pass by two work stations.

The first work station is where the fuel pump, belt pulleys, spark plugs, and valve cap are installed. The next step is to install the distributor, ignition wires, and hoses.

If it is a turboengine, it passes one more work station, where only the turbo unit is installed.

The work is done manually using screwdrivers, nut tighteners, hammers, and pliers. The engine can be raised and lowered on the trolley. It can also be rotated. This avoids uncomfortable work positions, saving backs and arms.

Scania's plant experts worked out the specifications for the trolleys in cooperation with the union and built prototypes before the purchase order was issued to Construction and Transportation Economy, the industrial truck manufacturer.

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AUTOMOBILE INDUSTRY

VOLVO LCP: NEW MATERIALS, PRODUCTION METHODS

Stockholm NY TEKNIK in Swedish 20 Oct 83 pp 36-37

[Article by Ulf Bergmark]

[Text] For auto manufacturers, building cars of the future is a way of trying to control the future.

The design will probably be outmoded in the year 2000, but perhaps not the technology. The Volvo LCP (Light Component Project) was built using materials and production methods that are expected to come into use as early as the 1990's.

What will the world be like in the year 2000? That is a basic question in a technical study of the future as it relates to cars. Will there be any petroleum? Will people be able to afford cars? How strict will environmental requirements be? Is it possible to foresee what the car buyer's tastes will be?

To a great extent, auto manufacturers themselves control developments. Developing and introducing a new vehicle technology takes from 10 to 20 years.

This means that a decision concerning a car for the year 2000 must be made in the 1980's. And a decision of that kind must be based on the technical know-how that exists today. No auto manufacturer can afford to invest millions--perhaps billions--of kronor in a technology whose future prospects are uncertain, no matter how interesting it may be theoretically.

All the lightweight, streamlined, energy-efficient, and electronically controlled cars of the future now being produced by auto manufacturers therefore provide a hint as to what auto technology will be like in the year 2000.

What is hard to predict is the situation with environmental requirements. As one Volvo expert put it:

"A physician who someday discovers a new and potent cancer-producing substance in diesel exhaust might consign the diesel engine to history's scrap heap in one fell swoop."

Two-Passenger Car

It is even more difficult to predict economic and social developments. Following very extensive market studies, Volvo's project group decided to put its money on a market in which the two-car family is the norm and the number of children per family is not very large.

That explains why the Volvo LCP has only two seats. The two additional backward-facing seats are only extras, and the back seat can therefore be converted into luggage space.

Their assessment may be entirely wrong. The economic situation may turn out to be such that very few people will be able to afford two cars.

It doesn't make much difference. It was the technical solutions that cost money to develop, and the resulting technology can also be used in an entirely different kind of car.

Requirements

Here are the specifications that the group had to contend with:

Curb weight without driver: 700 kilograms. Fuel consumption: not more than 4 liters per 100 kilometers. Top speed: at least 150 kilometers per hour. Acceleration from 0 to 100 kilometers per hour in no more than 12 seconds. Frontal area: no more than 1.8 square meters. Air resistance expressed in Cd's [drag coefficient]: not more than 0.3. The car was also to have a sporty look.

Most of those requirements were met by a good margin. One exception was weight: to satisfy all safety requirements, it was necessary to increase the weight to 707 kilograms.

Engine

The development group is testing two engines, both of which are three-cylinder diesel engines of approximately 1,300 cc. One is a finished prototype from Elko in the FRG. The other was produced by Great Britain's Ricardo with Volvo's help.

The search for a possible engine for the car of the future began with a gas turbine, the reason being that Volvo owns United Turbine in Malmo, which has been working for years to develop a gas turbine for cars. But a gas turbine does not even meet today's requirements for low fuel consumption. For it to do so, there would have to be a technical breakthrough that so far is not in sight.

Fuel Consumption: 4 Liters per 100 Kilometers

In this lightweight car, both engines use less than 4 liters per 100 kilometers in mixed driving. A gas turbine takes about three times as much.

All the alternatives to a diesel engine were rejected. Either they consume too much energy or their potential for development is uncertain, an example being electricity.

One reason for the low fuel consumption is that the engines use direct fuel injection, a technology used in big truck engines.

The diesel engines in all of today's passenger cars have a small precombustion chamber into which the fuel is injected. The result is less efficient combustion. But on the other hand, today's engines do not "chatter" as much as the Volvo LCP's engines do. It is also easier to meet exhaust requirements with today's diesel engines.

Colza Oil

The West German engine lacks a water cooling system, which usually "steals" energy. Cooling is provided by the motor oil circulating around the engine. The engine is cast iron and runs well on many different fuels. One of the four experimental cars is being powered by colza oil--as is obvious from the fact that the car smells like a hot dog stand.

The British-built engine has an aluminum cylinder head and a magnesium engine block. This makes it 32 kilograms lighter, and it weighs only 98 kilograms. It is equipped with a turbocharger, and its output is a full 66 kW (88 hp), compared to the cast-iron engine's 39 KW (52 hp).

Some hard work remains to be done before the engines can be placed in production. For one thing, they need an injection system that can atomize the fuel even better so as to meet the requirements concerning particles and nitric oxides in the exhaust.

But small direct fuel-injected diesel engines will probably never be "environmentally pure" engines.

Materials

The choice of materials is guided by a complicated economic calculation. Various values regarding fuel price and weight reduction as weighed against the cost of materials and so on are included in the formula.

Rolf Mellde says: "The formula is a secret. It cost a lot of money to work it out."

A basic requirement is that weight reduction achieved at the expense of lighter and more expensive materials must pay for itself in 3 years of normal driving (15,000 kilometers per year).

So if fuel is still cheap in the year 2000, the percentage of magnesium and structural plastic used will be low.

The reason for the 3-year limit is that a new-car buyer today seldom keeps his car longer than that. A new-car buyer is not willing to pay for an "everlasting car."

Magnesium is used for a number of components in the experimental cars: engine block, brackets, intake manifold, wheel rims, and so on, for a total of 50 kilograms. The result is a weight reduction of 200 kilograms compared to using steel for those components.

Aluminum

The brake discs in front and the drums in the rear are made of aluminum with a plasma-sprayed iron surface. They were developed by Volvo in cooperation with Hoganas. A production study concerning the discs will soon be completed. The reduction in weight and aluminum's excellent heat dissipating properties make it worthwhile to begin using aluminum brake discs even now.

Production

The assembly line will be scrapped if the Volvo LCP goes into production. Most of the assembly work will be done in small units by subcontractors.

That is possible because most of the components are preassembled in modules that are easily combined to make a car.

The module concept reduces assembly time by one-third and makes the job easier to automate.

It is a radical production philosophy, and it was worked out in close cooperation with production experts within the firm.

Large portions of the car are glued instead of being welded. This is a necessary technique when many different materials are to be joined. Gluing is becoming increasingly common in the aircraft industry.

The disadvantage of gluing is its injurious fumes, and this is especially true of epoxy cement. Another disadvantage is the fact that it is laborious precision work.

Robots Do the Gluing

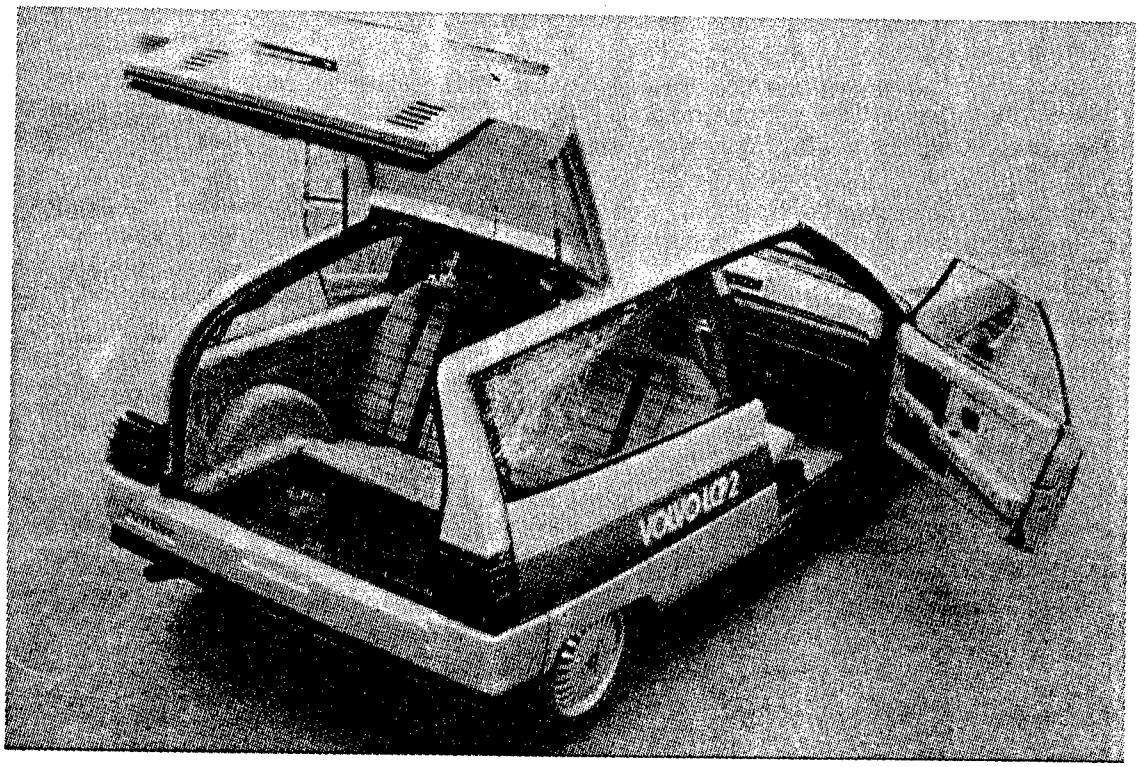
The solution will be to let industrial robots take over the gluing work.

Most of the materials used are stainless, primarily because plastic, aluminum, and magnesium are lighter than steel. But several dozen kilograms are also saved in the weight of the underframe.

The frame is of aluminum. But a plastic lower shell is also going to be tested, and this will include collision tests. Using plastic would make it possible to reduce the number of components in the lower shell from 43 to 6. Plastic also has much better sound-deadening qualities. The problem is to construct a durable lower shell while keeping the plastic from being too expensive or too heavy. The roof, hood, and outside panels are made of glass-fiber-reinforced polyester. The side and rear windows are made of polycarbonate. Polyamide, polyester, and carbon fiber are other plastics used in the car.

The modular system and all the plastic components will make it more difficult to repair the car in the usual way. Many parts will therefore be sent out for reconditioning in an exchange system.

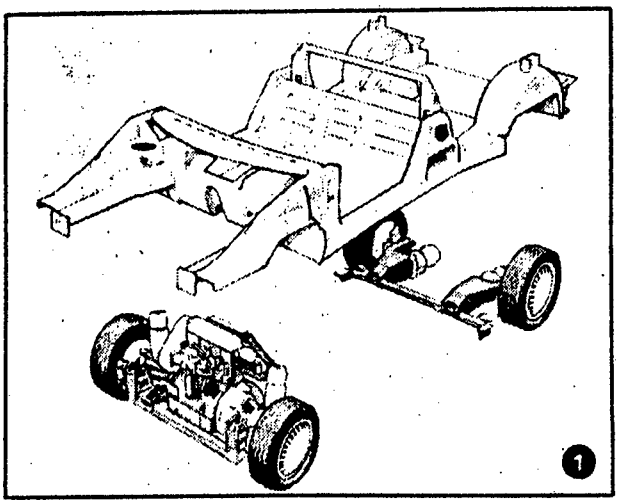
Rolf Mellde says: "That may reduce repair bills and provide more uniform quality in the work done."



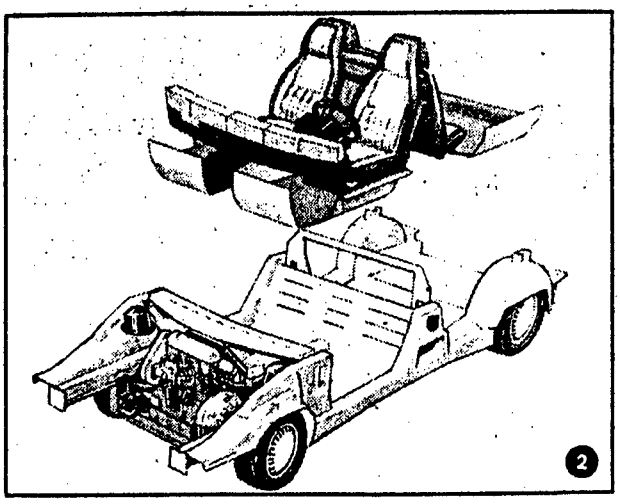
The Volvo 2000 is a car with unusual characteristics. New and lighter materials are glued together to avoid the weight due to today's welding process.

The car has large openings for entry and exit. The rear hatch includes half of the roof to provide an opening big enough for comfortable entry to the rear seats, which face backward.

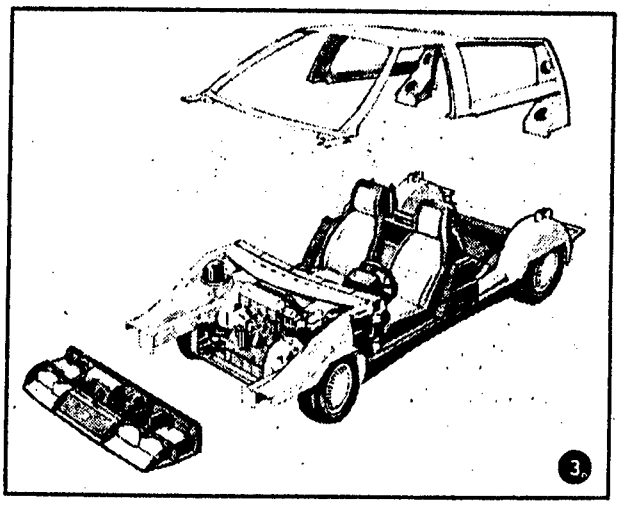
A three-cylinder direct fuel-injected diesel engine--with either a water-cooled aluminum block or one of oil-cooled cast iron--was the solution chosen by the engine builders for keeping fuel consumption to a maximum of 4 liters per 100 kilometers.



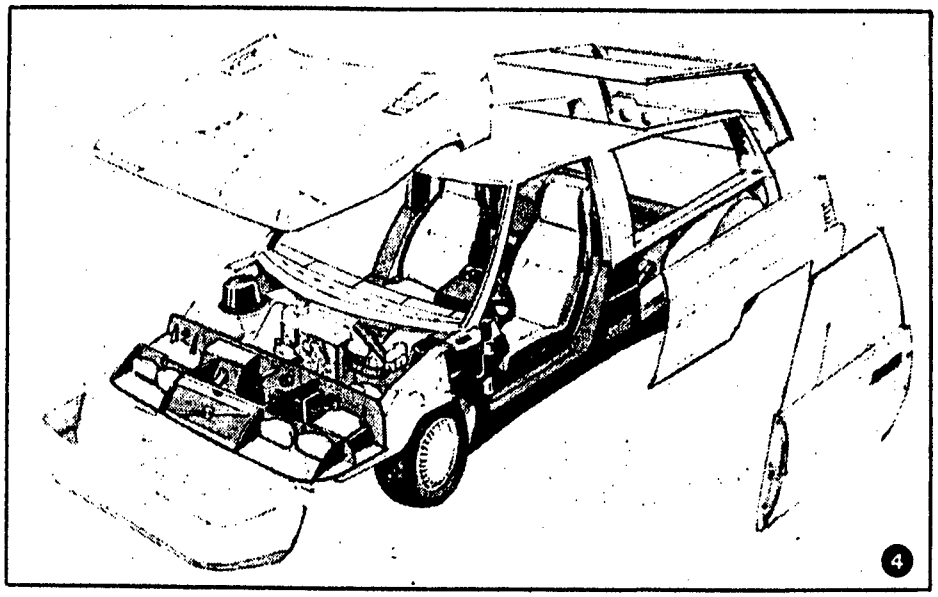
The underframe is joined to preassembled components such as front and rear axle assemblies, engine, and gear box.



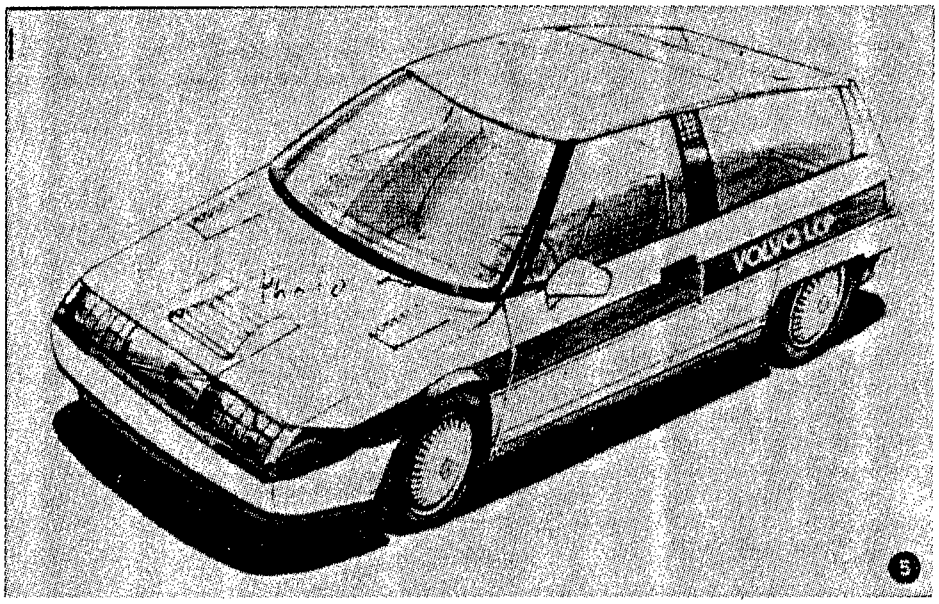
All the interior fittings, including seats, instrument panel, steering wheel, and pedals, are then lifted into the car.



In the next step, the front and superstructure are added. The car can now be driven, and any defects can easily be corrected.



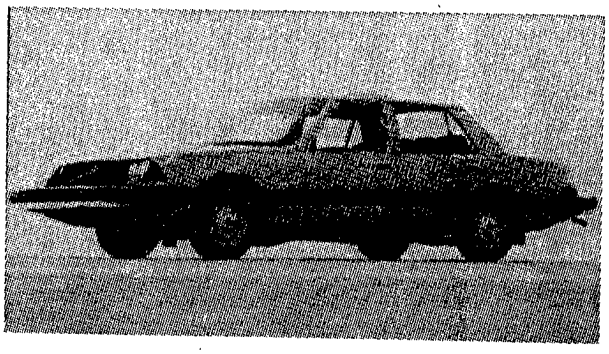
As the last step, fenders, rear hatch, doors, hood, and front panel are installed. These parts are made of plastic in order to reduce weight.

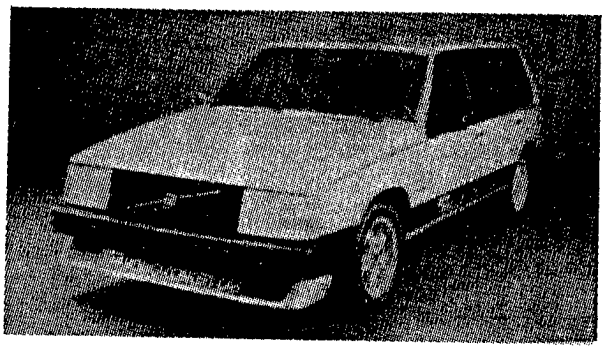


The result is the Volvo Light Component car, an energy-efficient automobile that weighs only about 700 kilograms and uses 4 liters of fuel per 100 kilometers.

From Experimental Cars to Mass Production

Project cars are built and rejected and disappear in the history of automobiles as documents of time. However, Volvo's project cars which have been shown to the public are usually quite close to the future mass-produced models.



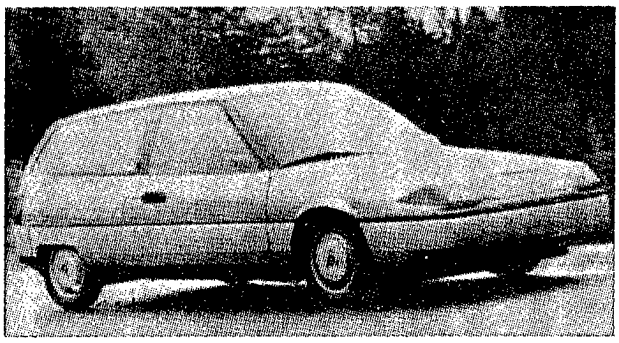


1972. Safety Car VESC--Volvo Experimental Safety Car--caused a lot of attention when it was presented in 1972.

1975. Volvo 240 became the big seller of the 1970's in Sweden. The resemblance to the VESC--e.g., the front "underbite"--is obvious.

1980. Somewhat more square was the VCC--Volvo Concept Car. The 1980's car was to look like this according to Volvo.

1982. Volvo 760 is the car that will compete with BMV and Mercedes in the status class. The "square shape" is borrowed from VCC.



1983. Volvo LCO--Light Component Project--is a possible recent sister to successful models PV 444 and PV 544.

19?? Even if design trends will call for adjustments, it is likely that the LCP will set the style for future Volvo models.

11798
CSO: 3698/91

BRIEFS

RENAULT, GERIN AUTOMATION PLAN--In a communique released last Thursday, the Renault Automation subsidiary and the Merlin Gerin Company have announced that they are "considering regrouping their operations in the field of programmable controllers." According to the communique, the two companies are planning to "pool their technical and industrial means" and are thinking of "sales of about 350 million francs, which would bring the new group closer to its major international competitors." The French market for these controllers is "estimated at 630 million francs in 1983 and is experiencing an annual growth rate of over 15 percent." Production plants are located respectively at Castres for Renault Automation (with the SMC Programmable Controllers Company) and Grenoble for Merlin Gerin. As the communique indicates, programmable controllers are fully electronic pieces of equipment which now represent the major part of systems used to control industrial processes and machines. These devices, the communique also states, have progressively replaced the traditional relay-set cabinets; they are sturdy, do not take much room, and are resistant to man-made noises. Neither manipulators nor robots, programmable controllers will allow any kind of changes in process control. [Text] [Paris AFP AUTO in French No 3377, 15 Dec 83 AFP 151140] 9294

VOLVO BUYS ITS RENAULT STOCK--The Swedish industrial group AB VOLVO has just bought back the 5.6 percent interest held by the French state-owned Renault Company in the Volvo private car subsidiary, the Volvo Person-Vagnar AB (Volvo Car), a Volvo spokesman announced last Tuesday in Goeteborg. The AB Volvo group now holds 90.6 percent of the private car sector stock, and Renault 9.4 percent, compared with respective figures of 85 and 15 percent after the 1979 agreement. The Swedish manufacturer decided to buy back part of Renault's interest in its automobile subsidiary because of the excellent results achieved this year: car sales alone, which represent one fourth of the group's operations, progressed by 50 percent during the first 9 months of 1983, when 267,000 cars were sold, representing sales of 18.85 billion Swedish crowns (the same amount in French francs). During the same period, the Volvo group, which also manufactures trucks and is involved in the food and energy sectors, increased its profits before taxes by 66 percent, to a total of 3.2 billion crowns. Under the agreement signed by the two automobile groups, Renault indicated in Paris, Volvo Car will repay an 80-million crown loan to Renault, and Volvo AB (the parent company) will buy back from Renault 40,577 Volvo Car shares amounting to 160 million crowns; these shares had been acquired by Renault after the conversion of one of the two 80-million crown loans made in 1981. Renault will retain the right to appoint two members of the Volvo Car Corporation Board. Renault and Volvo also confirmed that they would continue their technical cooperation. The French automobile company indicated that the Dutch company Volvo Car BV, 30 percent of whose stock is held by Volvo, would also be involved in the technical cooperation agreement. [Text] [Paris AFP AUTO in French No 3376, 14 Dec 83 AFP 132032] 9294

CSO: 3698/213

SURVEY OF FINLAND'S BIOTECH INDUSTRY, FUTURE

Helsinki HUFVUDSTADSBLADET in Swedish 12 Nov 83 p 18

[Article by Lena Westerholm]

> [Excerpts] In 1972, researchers succeeded for the first time in transferring a gene from one organism to another. Today genetic engineering has become a completely separate field of science which obviously has a bright future ahead of it not only in medical research but also in the most widely varying fields. Industry has awakened to the possibilities it opens up, and competition is increasing. The firms are saying: "We must be in on development." So the industrial possibilities of genetic engineering are now being tested in Finland as well as elsewhere. Firms producing alcohol, sugar, dairy products, cellulose, and, of course, medicines have joined in the game. Plant breeding is another area of current interest.

This year Finland got its own Institute of Genetic Engineering under the control of the Helsinki University Senate. The idea is to centralize research in one place and provide training. Many industries are heavily involved in the undertaking: they have researchers at the institute, they have signed project agreements, and they have participated in the financing. And a little over 6 months ago, seven firms--Alko, Farmos, Metsaliiton Teollisuus, Neste, Orion, Finnish Sugar, and Valio--formed a new corporation that will provide financing.

The fact that Finnish genetic researchers were the first in the world to successfully produce interferon using two kinds of Bacillus bacteria was the chief reason for the establishment of the new company known as Genesit.

Genesit's purpose is to try to come up with effective methods of using the Bacillus technique to produce various kinds of protein for industrial use.

Microbiologist Ilkka Palva, whose doctoral thesis was concerned with the Bacillus technique, heads the research.

"The Sitra Jubilee Fund has been supporting genetic research for several years and has now applied for a patent on the 'Bacillus technique' in its own and

Ilkka Palva's name, the intention being to turn the patent over to Genesit," says Kirsti Niinisalo, the new company's managing director.

Incidentally, that patent application was the first to be submitted in Finland for manufacturing protein using hybrid DNA technology, and its processing is in the final stages. Patents have also been applied for in the other Western industrial countries.

First Patent

The application for the "Bacillus patent" was the first DNA patent application in our country. But the first patent to be approved for DNA technology actually belongs to Orion, the pharmaceutical firm, which last summer obtained a patent on a method that can be used to diagnose various kinds of microbes--viruses, for example--using DNA. The specific application is not yet clear, but intensive work is underway to solve that problem. In any case, the idea is that it will permit quick diagnoses and eliminate the currently lengthy process of identifying viruses, to use the same example. Among other things, the current process involves the time-consuming cultivation of the virus for identification. Orion is now trying to produce the DNA preparations needed for the new method.

Project leader Juhani Olkku says: "I don't want to indicate a timetable, but it may become a reality in a few years. It also looks as though the price will not be too high, either."

According to Olkku, genetic engineering has had a stimulating effect on biotechnology as a whole, and he is not alone in that opinion.

"Valio Must Take Part"

For example, Valio's research director, Kari Salminen, says: "It is a promising technology of the future and a technology that we must keep up with. Valio, which makes extensive use of biotechnology and living organisms in its production, cannot afford to stay on the sidelines and simply look on. We must take part. But we are moving forward cautiously, and this is only our first step."

What that means is that the company has a group of five researchers familiarizing themselves with the technology--two of them abroad.

For Valio as for other firms, it is a matter of producing the microbes needed in production as well and as effectively as possible.

Cheese and sour milk are products that may be affected by the new technology in the future. But:

"We expect to have the basic technology mastered in perhaps 3 years, and not until the 1990's will we perhaps be able to apply it in practice. In other words, we have not even gotten off the ground yet. But it is promising."

Sugar Products

It is so promising that the technical manager of Finnish Sugar's plant in Hanko signed up for 1 or 2 years of classes at the Institute of Genetic Engineering. Paavo Lehtonen is his name, and he says:

"Incidentally, Finnish Sugar is already heavily involved in biotechnical production. Now we want to add to our methods."

Fermentation processes are needed in biotechnology, and enzymes are the proteins that start the reactions. The Hanko plant produces the enzymes needed to further refine starch.

The goal is to try to use genetic engineering to come up with new strains of microbes that can improve the fermentation process and make it more effective. The company has been involved in this research for quite a long time and has had several projects underway outside its own plant. The results of those projects will begin to be applied one after the other. Paavo Lehtonen says that the firm may begin experimenting with one hybrid DNA-based procedure on its own before the end of 1983 and perhaps start another one in 1984.

"It is completely obvious that genetic engineering is going to be of great importance, and we are adapting our processes with that in mind."

Alko Among the First

One of the very first firms in Finland to begin investing in the new technology was Alko. Experiments are conducted at the research lab in Helsinki and at the enzyme plant in Koskenkorva. And it all looks good. It may be possible as early as 1984 to begin using the first enzyme produced with the hybrid DNA technique, but Reino Ylikahri, head of the research lab, does not want to say more than that.

The enzymes that are needed help speed up the process of changing starch into sugar and then into ethanol. And by producing the enzymes by genetic engineering, the process becomes both more effective and cheaper.

Genetic engineering has been a natural path for Alko to follow, and more employees have been hired for the purpose. The researchers have undergone training both abroad and at our own Institute of Genetic Engineering. The goal is to increase the yield from the same amount of raw material in the cheapest and most effective way.

Ylikahri says: "This is something that we must be in on."

Wood Residue

At the Central State Institute for Technical Research, attempts are being made to develop new microbes of a kind which is not found in nature but which can be used to convert wood into sugar and ethanol. This is already being done,

but with expensive enzymes. To make the process more effective, there is a need for microbes that will produce new and cheaper ones. The work has been underway for 3 years, and it has now progressed to the point that the characteristics of two genes that control enzymes for breaking down cellulose into sugar have been determined.

Jonathan Knowles, who heads the work, says: "With new enzymes, we can modify the entire process, especially for the extraction of ethanol, which is an important chemical.

"This is something of overall importance, because if anything, Finland has lots of wood waste. But the competition is stiff in this area."

Resistant Plants

On the whole, genetic engineering is something that has made many industrial firms take a fresh look at their future possibilities. The latest to become interested is Kemira, which has signed a research contract with a California firm to develop a modification of plants--that is, to use the hybrid DNA technique to make them resistant to disease. Sitra also has plans to become involved in research projects in the field of plant breeding.

The United States is the country that has concentrated most heavily on biotechnology. It is followed by Japan. And after them--but still far behind--are the European countries.

11798
CSO: 3698/190

FINNISH INTERFERON RESEARCH, NEW APPLICATIONS

Helsinki HUFVUDSTADSBLADET in Swedish 22 Nov 83 p 14

[Article by Lena Westerholm]

[Excerpts] Developments on the interferon front are particularly dynamic at present. Research in connection with interferon has been underway for 25 years. In the beginning, everything proceeded calmly, and interest was not excessively great. But the situation has changed radically in recent years: researchers around the world and the pharmaceutical industry have awakened, and industry is currently the center of research activity. Large quantities of interferon are being produced both from white corpuscles and by the hybrid DNA technique, clinical trials are underway throughout the world, the competition is stiff, and a lot of money is involved.

In the midst of it all is someone who has been involved since the beginning: someone who decided quite by chance to work with interferon immediately after it was discovered, who has continued on that path, and who in present-day biographies lists only one hobby: interferon. He is Prof Kari Cantell of Helsinki. For many years, in cooperation with the Red Cross blood bank, his laboratory at the Institute of Public Health provided most of the interferon available in the world. The Finnish share now accounts for only a fraction of the supply. Cantell's laboratory provides the product free for clinical trials, while the blood bank exports it for a fee. Most of the exports go to Sweden and the United States.

When all the hullabaloo over interferon arose a few years ago, Kari Cantell did not know exactly what to think about it. But today he is pleased. Interest was aroused, and interferon production has increased.

Combinations

According to Kari Cantell, it also seems quite clear today that by combining different types of interferon, the effect can be increased. Perhaps this is especially true of the most recently discovered gamma group. This is something to which Cantell's laboratory has devoted a lot of research in recent times. The lab has succeeded in producing very good gamma interferon already, but as the professor says, its purity still needs to be improved.

"I'm an optimist. I believe that we will soon be able to produce better gamma interferon, and then we can start trying out combinations."

"It is so dynamic," he said, and then the telephone rang. The Children's Clinic wanted advice concerning a patient whom it wanted to try treating with interferon. Cantell gave advice and pondered the matter.

The way things are today, interferon cannot be obtained for money. It is Cantell who decides whether he will supply the product for clinical tests or for individual patients. Interferon is not yet on pharmacy shelves, but it has happened that foreign patients have nevertheless come to Finland to procure the substance, thinking that it was in routine use.

In West German Pharmacies

"It will still take decades of research before we reach the point of providing routine interferon treatment. But someday it will be in pharmacies--I'm sure of that."

So far only one country has added interferon to its list of licensed medicines available on prescription, and that is the FRG, which has begun selling interferon for use against shingles. Interferon is used against herpes affecting the eyes in some parts of the world.

Professor Cantell ignores the interferon-based influenza medicines being sold as pharmaceutical preparations in some East European countries, among them the Soviet Union. What they actually are and what effect they have are not sufficiently well known in the West to allow conclusions to be drawn.

"We can be convinced, however, that the results we have today certainly do not provide the right answers yet. But gradually...."

Side Effects

Clinical tests with interferon are also currently underway in Finland. At the Mejlan Hospital, the substance is being tested on a particular type of lung cancer, while the Neurological Clinic is testing it on a serious disease of the central nervous system known as ALS. It is clear that interferon affects the nervous system, and it also produces side effects in patients treated with big doses. Immediate influenza symptoms are another side effect--especially after the first injection--in the form of fever, muscular aches, and so on.

Other diseases on which interferon is being tested in Finland are cancer of the ovaries, tumors in the throat and head, benign growths in the larynx, leukemia, and AIDS--one of the two AIDS patients we have has now become completely free of the tumors known as Kaposi's sarcoma, to which that disease often leads.

Post-Transplant Help?

All of those tests are being conducted with interferon from leukocytes. But tests have now also started with so-called DNA interferon--for example, against

herpes and during organ transplants, in which one big risk is the infections to which the patient is subject because his own immune system must be weakened to prevent rejection of the organ. Interferon may be of help in this case in fighting off those infections.

11798
CSO: 3698/190

CIBA-GEIGY TO MARKET BIOTECH PRODUCTS SOON

Paris CHIMIE ACTUALITES in French 28 Nov 83 p 7

/Text/ The biotech research directors of the Swiss group Ciba-Geigy, on the occasion of the recent commencement of operations of a new biotech laboratory building, part of the group's Basel facilities, confirmed that the company was conducting about ten research projects in this field, some six of which could lead to products in fairly short order.

Professor Jakob Nuesch, Director of the biotech department of Ciba-Geigy's pharmaceutical division (he was the chief when it began in 1980), stated that although the Board of Directors had set the managers no deadline for when this department would begin to pay, he himself nonetheless considered that the policy should be reviewed if no current project proved able, within ten years, to lead to marketable products. This, however, should not be the case since certain projects are termed "highly advanced." Some of these projects are known. They involve interferons (a field in which Dr F. Meyer is one of those who steers away both from exaggerated optimism and unwarranted disappointment with respect to the inadequacy of current knowledge), antibiotics (cephalosporins), and other potential drugs, as well as plant-health and animal-health products.

In pharmaceuticals, research on the plasminogen activator appears to be the most advanced. An elaboration process beginning from plant cell cultures of scopolamine, the active principle of seasickness drugs which is already one of Ciba-Geigy's specialties, is being actively investigated as well as extraction of biotechnological means of substances naturally excreted by leeches (which can have useful applications in, for example, the treatment of pulmonary emphysema). Lymphokins and the surface antigen of hepatitis are also being talked about.

Biotechnologies represent about 20% of the total R&D budget of the Ciba-Geigy pharmaceutical division (which represents about one-third of the group's total R&D expenses, which amounted to 1,175 million Swiss francs in 1982). The new building (which houses class P2 and laboratories and a P3 laboratory), unique in Europe, represented an outlay of 42.8 million SF, employs 155 people, a majority of whom were already group employees.

Its startup in October represents a change in the dimensions of the group's biotech research which dates back to 1955 when its first work was done on antibiotics and steroids.

In fermentation, the Basel facilities are limited to 3000 liters, while the large-scale production fermenters (up to 150 m^3) are in Torre Annunziata, Italy. The antibiotics Rimactan and Celospor and the iron chelator Desferal were thus the first biotechnological products of the group, work subsequently focused on metabolites and the manufacture of peptides and proteins with the aid of genetic engineering.

In the agrochemical sector (which accounts for approximately a second third of the group's R&D effort), the biotech approach was implemented only recently. In 1982 it was decided to extend the group's research activities to the biotechnology field (including genetic engineering), and last summer ground was broken for the new biotechnology institute in Research Triangle Park, North Carolina. This institute will employ 60 people and will work mainly on improving the properties of crop plants, under the direction of Mrs Mary-Dell Chilton. This institute will cooperate closely with the other research units of the Ciba-Geigy group, particularly in the seed sector which is one of the main activity areas of the agricultural products division. (From our special correspondent in Basel).

12434
CSO: 3698/186

BIOGEN, JAPANESE JOIN FOR RESEARCH, MARKETING

Paris CHIMIE ACTUALITES in French 5 Dec 83 p 7

/Text/ The international biotech company Biogen and the Japanese group Yamanouchi Pharmaceutical announced an agreement for development a new anti-inflammatory agent which could improve treatment of arthritis, asthma, and dermatitis, among other disorders. Under this agreement, Biogen will be in charge of purification and large-scale production of the product, while Yamanouchi will perform the preclinical and clinical tests and obtain the exclusive marketing rights in Japan, Taiwan, and South Korea under a Biogen license. Biogen will receive research funds from Yamanouchi and eventually participate in the sales profits.

This new anti-inflammatory agent, intended for an estimated market of 3 billion dollars per year, is a protein that would be the mediator (or the next element in the biochemical sequence) of the anti-inflammatory action of steroids.

For the first nine months of the year, Biogen's financial picture did not look as good as the corresponding period in 1982: 14.89 million dollars (1982: 17.7) in incomes for a net loss of 5.705 million (1982: 2.163). R&D contracts amount to 9.04 million dollars, by contrast with 11 million one year earlier.

The third quarter saw the start of clinical tests on gamma interferon (the first obtained by genetic engineering), the beginning of the last preclinical testing phase of interleukin-2, a new stage in the development of tissue plasminogen activator in cooperation with Monsanto and Fujisawa Pharmaceutical, and the start of production of animal growth hormones for IMC.

12434
CSO: 3698/187

CANADA DEVELOPING BIOTECH TOOLS FOR POLLUTION CONTROL

Paris AFP SCIENCES in French 10 Nov 83 p 58

/Text/ Two Canadian biologists have discovered molecules capable of recognizing and attracting dangerous metals and thus able to serve as "microscopic vacuum cleaners" in nuclear power plants and the metallurgical industry.

According to "Hebdo Canada," published by the Canadian Development of Foreign Affairs, these molecules, discovered by Irvin Devoe and Bruce Holbein of McGill University, can capture the tiniest metal particles such as mercury, cobalt, uranium, cesium, and strontium with surprising efficiency.

They "swallow" 99.999% of the radioactivity of cobalt 60, one of the hottest waste products of nuclear reactors, so that the cooling water can be decontaminated and the concentrated waste can be fused with glass.

These molecules, says "Hebdo Canada," are easy to make, inexpensive, stable, nontoxic, and withstand industrial temperatures. Fixed to glass or teflon, they are reusable indefinitely: an increase in acidity content or electrical discharge causes them to release their metal harvest.

In addition to pollution control, they can be used for seawater extraction, control of industrial effluents, and preservation of pharmaceutical products by extracting the iron they contain.

In brief, they can be used wherever it is desirable to extract dissolved metals, according to the two biologists who plan to market their discovery in two years time in Canada and abroad.

12434
CSO: 3698/186

BRIEFS

BIOGEN LICENSES U.S. PROCESS--Biogen acquired the sole license to utilize a new genetic engineering process for protein synthesis by bacterial cells which has just been patented by Harvard University. This process, which resulted from the work of Dr Walter Gilbert, who at the time held the American Cancer Society chair of molecular biology at Harvard, and three of his colleagues has important advantages over the conventional method of expressing recombined genes, according to the president of Biogen. The U.S. patent was granted after a court case involving a similar patent filed by University of California researchers (who patented the conventional method). The European patent covers eleven countries including France. /Text/ /Paris CHIMIE ACTUALITES in French 5 Dec 83 p 5/ 12434

CSO: 3698/187

NEW FOKKERS, NO BREAKTHROUGH BUT COMPANY IS OPTIMISTIC

Amsterdam ELSEVIERS MAGAZINE in Dutch 3 Dec 83 pp 23-24

/Article by J. Heinemans: "Director Swarttouw is Optimistic: The New Fokkers, No Breakthrough but Considerable Consolidation"/

> /Text/ The two new Fokker airplanes, the "50" and the "100" are really improved old ones. A little longer, a little wider, new engines and a cockpit adjusted to the 1980's.

At the presentation of models and photos last week at the celebration of the silver anniversary of the successful Fokker Friendship, even experts had to look closely in order to see the differences between the F-27 and the F-28. The most striking thing about the Friendship's successor is the new Pratt and Whitney engine with a six-blade propeller (more economical and less noisy; it is high time especially for the latter); also, the door is in the front and the characteristic large convex windows are replaced by a larger number of smaller ones.

The exterior of the Fokker-100 differs from the Friendship at first glance only a little. The machine is somewhat longer, somewhat wider, and has new Rolls Royce Tay engines and new cockpit electronics with computers and visual display screens. In spite of stiff competition--especially the British were already on the market with this type of machine earlier--things are again looking rosy for Fokker. For the F-100, there is supposedly a market for at least 750 machines; for the "50," the sale of no less than 1,250 airplanes is being aimed for.

The content and proud faces of the Fokker management at the presentation. Forgotten is the wretched MDF-100 adventure with McDonnell Douglas, which was retreated from at a late stage, but just in time. Fokker is back on both feet again, and things are looking up for Swarttouw, who is as optimistic as in the old days. He is obviously worrying little about the government aid of 800 million guilders. He would prefer not to talk about it: "That is the business of the minister of economic affairs." But Swarttouw does hint that it would be very strange if The Hague did not come through with it. "First of all because that 800 million is actually still owed to us, since it was after all promised for the MDF-100 plans that never came off."

In addition, the Fokker management is reasonably comfortable with the thought that, in these very years during which the (Western) business world must have innovative and technically high-grade products, the government will not readily let a factory like Fokker fall. And finally, Fokker has always satisfactorily repaid all debts incurred with the government for the Friendship and Fellowship. The F-27 is long since paid off. The advance financing for the F-28 has for the most part been settled with the government.

In spite of the recession and other air travel woes, Fokker can also still be reasonably proud. So far, 753 Friendships have been built and delivered, making the F-27 the most successful civil turboprop transport plane in the world. A machine in which there is still interest, as evidenced by an Egyptian order for three machines, the contract for which was signed the other day.

Things are different with the Fellowship. Sales are stagnating as a result of stiff competition and a restrained market. With the 210 F-28s sold thus far, the break even point has not yet been reached, and in view of the new plans, it looks as if it never will be, because Fokker is providing itself with a formidable new competitor from within, in the Fokker-100.

Renovation and consolidation constitute the careful and possibly the only proper strategy that the Fokker management wishes to follow in these difficult years for air travel. The risks associated with the development of an entirely new type of airplane which could provide a breakthrough like the one that the Friendship, perversely enough, made in its day, are too great. Not to mention the gigantic amount of capital necessary (the financing of these "new" adapted Fokkers alone cost 150 million); there seems to be no room on the market for completely new models for the time being. It is indeed a sign of reasonable bravery to launch new projects during a recession. On this, Swarttouw said that his company appears now to have come to the end of a time "which was hard for us to endure." And: "We think that the most miserable period is behind us. That we're out of the woods. That we can handle our profits situation (14 million this year against a loss of 10 in 1982) next year." For that matter, he calls it characteristic for a company like Fokker not to give up in despair during gloomy times, but to do its best, and in the aircraft construction industry that means renovation.

And the fact that things have been going against Fokker in recent times is clear from, among other things, the elimination of 1,500 jobs, of which 650 were forced, and a decrease in the number of machines to be built in 1984. Instead of 32 machines, only 13 Friendships and 12 Fellowships will roll off the assembly line next year. A measure that has already given rise to a shortening of work hours for a large part of the plant personnel.

But at the festive presentation last week, for which Fokker had the good sense to invite 170 clients from 70 countries to the Netherlands, optimism was trump. It was announced, for example, that 100 Tay engines had already been ordered from Rolls Royce for the new "100." One would almost think that there is reasonable optimism about the sale of at least 50 F-100 machines.

While it can also be concluded from comments made by Swarttouw that the time is not far off when Fokker will have to attract new personnel. "Perhaps even more than we have unfortunately had to lay off thus far."

Fokker appears to be picking up again somewhat. Correcting its course in the beneficial thermal currents of a very slowly recovering world economy.

12271
CSO: 3698/199

CIVIL AVIATION

A320 DESCRIBED AS 'TECHNOLOGICAL LEAP'

Paris REVUE AEROSPATIALE in French Nov 83 pp 4-5

/Excerpts/ Wings

The aerodynamics of the A320 wings is the fruit of efforts by all Airbus Industrie partners. Benefiting from the irreplaceable experience derived from the comparison with the A310 made recently between forecasts and flight, it will be even better than the A310 whose qualities are already unanimously acknowledged: Thick contours allowing weight to be reduced, heightened aspect ratio and small area to reduce drag. Let's also take note that its present design benefits from the contribution of research made by Aerospatiale over many years in the field of transonic wings.

Of higher performance aerodynamically, the A320's wings are of a lighter design than the A310's: a better aerodynamic-structural compromise, with lighter high-lift devices.

The aerodynamic design of the pod and strut as well as their integration with the wings have passed a significant technological milestone: jet simulators (TPS) much more representative of engines than the simple permeable pods previously mounted on mockups were utilized in wind tunnel trials from the design stage. More efficient shapes can thereby be designed from the drag point of view, shapes which cannot be achieved until much later in the design phase when the main outline of the structures is set.

Structure: a significant part of the structure will be put together with composite materials, primarily carbon fibers (mainly horizontal and vertical stabilizers). The carbon-bronze openwork cloth recently developed by Aerospatiale and Brochier can be applied to the acoustical treatment of air intakes and jet pipes. Weight savings thus achieved, added to the classical "snowball" effect (effect allowing the rest of the aircraft to be lightened when a reduction in weight of one component is made), contribute significantly to the A320's low fuel consumption.

Wider

It is noteworthy that progress made in structural expertise both in light alloys and composites will allow the A320 to have a wider fuselage than that of its

competitors without increase in weight. It thus offers cainb comfort actually comparable to that of the wide-bodies, as well as enormous containerizable holds.

The flight compartment, lastly, exploits the technological breakthrough made on the A310. Aerospatiale, whose research in 1978 had made possible the design of this aircraft's revolutionary cockpit, continued its innovative efforts in the fields of ergonomy and style. In conjunction with Airbus Industrie, Aerospatiale also exploited and evaluated the experience acquired during development, certification and now exploitation of the A310. The fruit of all these efforts is for the A320 a flight compartment for two evoking admiration from experts and whose quality in terms of the man-machine relationship will be an added safety factor.

But the A320 is also a break with the past with its spectacular innovations. The most significant is the adoption for this aircraft of electrical flight controls. Concorde was the first civilian aircraft to be equipped with these flight controls. But mechanical controls were available in backup mode. With systems technology having progressed, it has become possible to design units with multiple redundancies whose level of reliability is sufficiently high for the mechanical backup system to be dropped. On the A320 only the steering control is mechanical. The A320 will thus be the first civilian aircraft equipped with fully electrical controls on both axes. Design for it was assigned to Aerospatiale.

The advantages of electrical flight controls are manifold: significant weight loss, incomparable flight and handling qualities, better integration of control support systems and reduced maintenance costs. Let us also add: increased safety against deviations from flight envelope by the possible installation of intelligent "barriers," more or less unyielding according to the seriousness of the case at hand.

Decision

A decision, however, remains to be made in the area of flight controls: will the traditional control stick be kept or, utilizing the most recent efforts of Aerospatiale's research bureau as well as experience acquired in the Concorde 01, will the infamous mini-control stick be adopted? The advantages and disadvantages are now weighted against the A300 number 3 with pilots of airline comapnies and certification officials. Meeting in December 1983.

The same philosophy has produced a second revolution: this involves control of the CFM 56-4 engine controlled by an electronic control box (FADEC) with full power. These two revolutions are bringing on a third one: traditional design of systems--flight controls, stabilizers, autopilot, autothrottle and, possibly, flight control computer--is completely turned upside down. A simultaneously more logical and more efficient redistribution of labor is produced. Resulting from it will be a reduced workload for pilots in all operating modes.

To these transformations must be added a remodeling of instrumentation and alarms based on cathode ray tubes with optimum use in design of related computers which, while reducing costs, allows reliability and technical availability to be increased.

BULL LAUNCHES PRODUCTION OF NEW MINICOMPUTER

Paris ELECTRONIQUE ACTUALITES in French 2 Dec 83 pp 1, 7

/Text/ Bull is preparing to specify its strategy in mini-data processing, a strategy whose pivot seems to be the SM 90, which the company will produce at a rate of 300 units per month, starting next March.

The development of this product will be undertaken by a GIP in which the CNET and the INRIA will take part. In addition, Bull will display its new Mitra, Solar and Mini 6 models in the next few days.

The SM 90, a multiprocessor microcomputer developed by the CNET and whose licensing was obtained by Bull last January, should soon be put in an industrial production phase by the manufacturer.

Three of these units have already been delivered to customers of the company at this time, and the production rate should reach 40 to 50 units per month by next month, and then speed up by March 1984.

At that time, Bull should have a potential production of 300 units per month.

This figure should be compared with that of the Mitra and Solar minis currently delivered, a ball-park figure of about 12,000 systems, whose producton rate is about 140 systems/month. At the same time, a structure is being set up which includes, along with Bull, the INRIA and the CNET and whose purpose is to develop of modules with software and hardware complementary to the SM 90.

All these data were announced to us during a tour of the CNET last 23 November, and Bull has confirmed them. Bull also indicated to us that the decision to mass-produce the SM 90 did not mean that it was giving up the Mitra and Solar series, new models of which are to be launched within a few days.

The main purpose of these models--the Mitra 725 and the Solars 16/35, 16/70 and 16/90--will be to enhance Bull's capacity to meet industrial demands, and it has been officially announced by the manufacturer that the SM 90 does not have adequate software capacity to succeed these instruments.

In fact, although it is true that the SM 90 will not have enough software capacity available to replace the Mitras and Solars for 18 to 24 months, there

is no reason not to think that, at least at some later time, such a succession should be effected by the manufacturer. In the immediate future, the SM 90, which appears as the first truly French Unix equipment, will be Sems' warhorse for branching out from its traditional markets.

This system will allow the manufacturer to enter the total market of real-time applications (telephony, followed by air traffic, etc.).

The large-scale manufacture of the SM90 will also mark Bull-Sems' arrival on the technical console market, for 2D CAD) computer-assisted design) applicatons, for example, or for uses in formatting technical documentation and other types of applications and markets which are presently the exclusive property of companies such as Hewlett-Packard or Apollo.

In this area, Numelec has also developed a graphics console, having a resolution of 1024 X 700 points, which Bull will distribute.

Further, the company will complete this strategy in the next few days by launching the new Mini 6 line that Honeywell launched in the United States in recent week.

8838
CSO: 3698/210

THOMSON NEGOTIATES WITH U.S. FIRMS ON MICROCOMPUTER PRODUCTION

Paris ELECTRONIQUE ACTUALITES in French 2 Dec 83 p 6

/Text/ Thomson will develop its microcomputer activities and has begun talks on this topic with several American manufacturers.

Prominent among these companies is Eagle, a company specializing in IBM-PC microcompatibles.

Although Thomson is claiming that it is still too early to reveal the nature of these contacts, there are whispers that they could result in business agreements between the two companies.

Further, this operation is being carried out under the control of the Thomson-CGE coordination committee created in view of the forthcoming takeover of Thomson's telecommunication activities by the CGE.

The company is also claiming that there is no problem regarding possible competition between it and Bull in the microcomputer slot.

Regarding Thomson's present microcomputer activities, it is worth remembering that they are focussed around the Micromega, the top-notch system from Fortune. In this respect, Thomson claims that, like most of its competitors, it made an error in estimation when the product was launched, as the growth of the French market did not reach the hoped-for volume; however, this has not prevented Thomson from reaching its goals for this year.

Thomson claims that it has installed 2,000 consoles in France this year but refuses to specify how many systems this corresponds to. According to some data, however, this number of consoles might correspond to about 700 systems, a number quite markedly below initial predictions.

Actual income figures are also difficult to know; some people whisper that it might be on the order to 130 million francs this year. Remember that the company's initial goals were 200 million francs (i.e., distribution of 2,000 systems).

8838
CSO: 3698/210

BRIEFS

'ULTRAMODERN' PHOTOMASKING PLANT IN FRANCE--Nanomask, the first independent mask factory, established in the south of France (Aix-en-Provence), is already meeting the increasing European demand for high-quality masks. Nanomask has invested 45 million francs in an ultramodern factory (Class 10 white rooms, temperature regulated within $\pm 0.1^{\circ}C$); the factory covers a 1,000-m^2 area. It is equipped with a Mebes II from Perkin Elmer (40 MHz, maximum glass size 7" x 7", beam size from 0.1 to 1.1 microns) and with state-of-the-art development, etching and control equipment; Nanomask can fill any order within 8 days. Nanomask provides quality commensurate with the performance of its E-beam: quality control is entirely ensured by the KLA 101-C unit which is coupled to the Quantronix Q/C laser repairing machine; thus, defects as small as 0.6 micron can be detected. [Text] [Paris INDUSTRIES & TECHNIQUES in French 20 Oct 83 p 195] 9294

CSO: 3698/213

FRENCH FIRM DEVELOPS DRY ETCH EQUIPMENT FOR MICROELECTRONICS

Paris ELECTRONIQUE ACTUALITES in French 2 Dec 83 p 13

[Excerpt] The Nanotec Company, located in the Industrial Zone for Scientific and Technical Research (ZIRST) at Meylan (near Grenoble), was formed 5 months ago by two former LETI scientists (Parrens and Deschamps), with permission of LETI, to develop the most recent research results in the field of microlithography techniques using reactive ion etching (techniques of resin trilayers, slope etching, leveling and spacer manufacture) and thereby to facilitate their transfer into industry. Nanotec is also negotiating with CIT-Alcatel about signing an agreement for industrializing the equipment that it will develop and will market, mainly for automated production lines and for research and development laboratories.

The French company is currently working on a single-reactor reactive ion etching apparatus adapted to all processes except aluminum and which will allow, in addition, slope etching, leveling and the use of multilayer structures. This apparatus, conceived by Nanotec and whose manufacture will be subcontracted (partly to AET, a French company also located in the ZIRST and which is developing a GIR-type equipment), should be turned over to the LETI at the start of next year. Two other apparatus of the same type have already been sold to the LETI and to the CNET.

Although Nanotec will remain a "think tank", it plans to exist more from the income from its sales than from subsidies, and it is presently marketing two programmable end-etching detectors (one based on analysis of the light emission characteristic of the excited etching-reaction products in the plasma, the other on the reflectance shifts of a thin layer during etching) that can be used with GIR-type equipment (they seem to be especially complementary with the laser-interferometry system of CIT-Alcatel).

Nanotec (note that the name is temporary, since it already belongs to another company), which presently employs 5 people (6 planned for early 1984, 8 by the end of next year and more than 10 in 1985), was financed by Epicca (the CEA's money company), AET, DEFI (a money company having shares in a number of new companies in the ZIRST) and the public banks.

8838
CSO: 3698/209

FRANCE'S EUROTECHNIQUE ANNOUNCES 128 K EPROM

Paris ELECTRONIQUE ACTUALITES in French 2 Dec 82 p 14

[Text] For the past year and a half, Eurotechnique had announced practically no important product (except for the COFIDEC, conceived at NS by Eurotechnique personnel). Indeed, opportunities had been blocked, or nearly so, since mid-1982, when NS was sure that the company's stockholder would change. For the last 6 months, however, Eurotechnique personnel have again begun to see what direction they need to work in and to make long-term plans. And since the EFCIS and Eurotechnique directories are complementary, everything will continue on the original schedules in the coming months. Eurotechnique has therefore shown a 64-Kbit N-MOS EPROM at the exhibition. The 128 K should be ready in January, and the 256 K should in principle follow at the end of 1984.

In the context of its cooperation with NS, Eurotechnique was assigned to develop advanced EPROMs for both companies. This job has now fallen to the Rousset plant, following its takeover by Thomson Semiconductors. The job has two features: make up a lag up to 256 Kbits and essentially take over world leadership in 1986-87 with a 1-Mbit EPROM using 1.5-um C-MOS (complementary metal oxide semiconductor) technology (Eurotechnique would, in fact, like to be the second company in the world to announce this product). Eurotechnique will also make advanced dynamic RAMs (random access memories): the 64 K will be made as second source in 1984 with purchased know-how; the 256 K will be made in the same way. The purpose here is not to be a leader but to learn how to manufacture in large quantities with good returns so as to be competitive; this know-how will help the EPROMs but also the static C-MOS RAMs which will also be one of the major directions of the company's memory development; starting with EFCIS know-how, Eurotechnique will especially develop a 64-Kbit C-MOS RAM which should be in production between now and 1985.

But Eurotechnique's design center (30 people) will also work on microprocessors and telecom circuits; for the former, starting with a low-cost C-MOS process, the problem is to develop 4-bit COPS with peripherals on the chip, as well as a new, more universal, COPS; for the latter, there will be no competition with EFCIS--Eurotechnique will concentrate on the circuits for subscriber cards. Eurotechnique's job also includes everything that has to do with storage cards. Eurotechnique, however, will not develop the 1600 microprocessor, as it was expected to do 2 years ago, and it has given up its card activity to leave the initiative to EFCIS in this area.

Eurotechnique, which is producing 15,000 4-inch slices/month in 2.5/3 um technology, is presently investing in a 2-um line (4 inches initially, expected to be converted to 5 inches in mid-1985). When this line is set up, the factory's occupancy will rise from a third to half. Among other things, the plant will be used to mass-produce a 64 K C-MOS EPROM early in 1985.

8838
CSO: 3698/209

SIEMENS SAMPLES POWER MOS WITH FAST PARASITIC INVERSE DIODE

Paris ELECTRONIQUE DE PUISSANCE in French Nov 83 pp 31-32

/Article by J-P Della Mussia/

/Text/ Siemens is currently sampling under the designation BUZ 211 the first power MOS whose parasitic diode is relatively fast because the company specifies its blocking delay as 180 ns. By way of comparison, the BUZ 45A, which is the equivalent of the BUZ 211 in the company's current catalogue, has a parasitic diode with a recovery time of 1,200 ns, which leads to large commutation losses in many assemblies if precautions are not taken.

This important stage in the evolution of MOS characteristics is not the only one crossed by Siemens recently.

In particular, this company has just introduced nine MOS's according to its new SIP MOS II technology, which is intended to replace in time the SIP MOS I technology, which was the basis for the development of power MOS's, but which is today considered by specialists to be a costly technology with silicon surfaces.

Moreover, Siemens is now studying combinations of power MOS's and control circuits on a single chip. An MOS with Schmitt control trigger to reduce the inlet capacity has been achieved experimentally (the MOS here behaves like an integrated circuit) but is not expected to be commercialized without further testing. Moreover, Siemens is considering the creation of punch regulators with integral power units. Other specialized circuits are under study, in particular for the automobile industry; they integrate control, drivers, and temperature regulation. These circuits are expected to be in produciton by the end of 1985. As to simple power MOS's as such, in coming years Siemens expects to be able to still further reduce the transient resistances from 10 percent to 20 percent for the same chip surface, regardless of the range of voltage maintained.

One Fewer Exterior Diode

The MOS transistors are all equipped with a slow inverse diode which most of the time causes the supply originators to put a fast inverse diode in inverse parallel on their MOS's.

Unfortunately, figures in the manufacturer's instructions for the blocking delay and recovery times do not mean much because they vary (by up to five orders of magnitude) according to measurement conditions. But this problem certainly is annoying.

The Siemens BUZ 211 500 V/0.8Ω permits eliminating an exterior diode: In fact, Siemens advertises a typical blocking delay time of 180 nx to 25 ns /as printed/ for the 9A parasitic diode (250 ns max at 25°C; 300 ns max at 150°C) with a direct current equal to the alternating current and a di/dt of 100 A/μs (charge of 2.5 μC max at 150°C; (typical IRRM /expansion not known/ of 15 A). We are dealing here with an unquestionable performance improvement taking into account the 500 V voltage of the transistor but which comes, however, not totally free.

This MOS in fact required among other things doping with platinum and a change in the channel shape /both of/ which affect the transient resistance of the MOS: According to an internal note by Siemens, at 25°C the BUZ 211 has a resistance of 0.8Ω; its equivalent in conventional technology, the BUZ 45A, has a resistance of 0.5Ω. And at 150°C the two transistors have the same transient resistance: 1.2Ω. In the date sheets of characteristics, however, the two devices are identical, 0.8 Ω max at 25°C; 1.5Ω max at 120°C.

The BUZ 211, mass production of which will begin in the first quarter of 1984, is the first type of a 500 V and 800 V series with a chip surface of 36 sq mm. It is packaged in a T03 package and has a typical inlet capacity of 3,800 pF (3,500 pF for the BUZ 45A). Its price should be 20 percent higher than that of the BUZ 45A.

Resistance Cut in Half

We have already stated in our pages that Siemens has commercialized a new family of power MOS's with a chip surface half as large as before for similar static performances short of 2,000 V, which calls on technology called SIP MOS II. This technology allows Siemens, for big contracts in particular (it appears that this may not hold true as much worldwide at the distribution level), to offer prices beating all competition.

Since October, nine types of MOS's have been in production.

These transistors, with a 2.5 x 3.5 sq mm surface, are offered in a TO 220 package. By way of comparison, the BUZ 20/100 V, for example, in SIP MOS I technology, has the same transient resistance of 0.2Ω as the BUZ 72, but its inlet capacity is 1,900 pF max and its cutoff time is 70 ns. The inverse recovery time of the parasitic diode has also been clearly improved with the new technology.

Siemens hopes that the new prices offered will open up for power MOS's mass production markets such as fluorescent tube ballasts, supplies for the general public, Hi-Fi amplifiers, automobile electronics, household appliances, etc.

The SIP MOS II technology calls on a self-aligning structure, which has allowed reducing the number of masks in manufacture. The grating interval has, moreover, decreased from 40μm to 20μm; the N+ layer is formed at the same time as silicon insulation. The quality of the silicon has, moreover, been especially looked after as far as mechanical resistance is concerned. Thus, the MOS active structure exists even under the contacts which can from now on withstand the bonding step without deterioration of the MOS cells lying underneath.

A Capacity of 30 Million Transistors a Year

To provide for the production of its power MOS's, we recall that Siemens has installed an assembly line in Munich with a capacity of 3,500 4-inch wafers a week (which supplies at present 1,000 wafers a week) or, in other words, 30 million modern transistors a year.

Siemens recognizes that the growth of the MOS market has not been as fast as expected but the company judges that, out of an $820 million 1982 transistor market, growing by 7 percent a year between 1982 and 1987, the share of bipolar devices ($800 million) will grow by more than 4 percent a year and that of the MOS's ($20 million) by more than 40 percent a year. Thus, in 1990, out of a $1,409 million transistor market, bipolar devices are expected to yield $1,095 million and the MOS's $391 million (28 percent).

The United States has been the most innovative in 1982: of a $20 million world MOS market, it accounted for $13 million, with Europe being limited to $4 million. By 1987, according to Siemens, Europe will increase its share: out of a $210 million world market, the United States will have $100 million and Europe $60 million (including one-third for Germany).

According to a study reported by Siemens, the 1983 MOS market will be $35 million, including $27 million in power /MOS's/ and $8 million in small signals. IR /International Rectifier/ will remain Number 1 worldwide in this area (with $12 million, including $11 million in power /MOS/), followed by Siemens ($6.5 million, including $5.5 million in power /MOS/), the specialist in small signals being Siliconix ($4.5 million, including $3.5 million insmall signals). Motorola will be Number 4 ($3 million), followed by Supertext ($2.5 million, including $2 million in power /MOS/), Hitachi ($2 million) and ITT ($1 million).

/Boxed insert/ A 600 V/0.3 A Optotriac

By next November Siemens should be able to sample a 600 V/0.3 A optotriac included in a simple package. This insulated 7.5 kV optotriac will use two chips, one a light emitter controlled by a 1mA current, the other combining two inverse parallel optothysistors /as printed/. It is obvious that this is an ideal component for the control of equipment supplied by local current, including fluorescent tubes.

Commercial production is expected by May 1984. But, before then, other optotriacs will perhaps be announced, in particular a 1,000 V model.

5586
CSO: 3698/181

CIRCUITS, SC'S INTEGRATED WITH ITALIAN SGS'S CHOPPING REGULATOR

Paris ELECTRONIQUE DE PUISSANCE supplement to 9 Sep 83 of ELECTRONIQUE ACTUALITES in French pp 23-25

[Article by JP Della Mussia]

> [Excerpts] For the first time, SGS is putting on the market a 4 amp chopping regulator with on-chip power circuitry. Its low cost opens up wide application areas. This constitutes a major step in the history of the integration of power circuitry.

The monolithic concept, with all its advantages, is now reaching the power area, not only in the union of several discrete power semiconductors on the same chip (triple Darlington) but also by the association of the controlling circuits with the controlled semiconductor. Already 3 years ago, National Semiconductor had announced that its "Moose" process would enable it to produce integrated 10 amp regulators; in mid-1982, Motorola also announced that its "SMARTPOWER" technology (vertical PNP + C-MOS) would enable it to offer a similar regulator.

Today, it is SGS's turn to announce a regulator with on-chip power circuitry, capable of providing 4 amps under a 5.1 to 40 volts programmable voltage. But this time, the problem is not the same:

--The sophisticated regulator is no longer of the series type but is a chopping regulator.

--The anticipated price is $3.00 in quantities of 50,000. It is therefore no longer a product intended to test a technology or a market, but a mass-produced product whose objective is not only to take over the position on the market of some hybrid regulators (offered by National Semiconductor, Fairchild, or Unitrode in the United States, at $4.00 to $5.00 for example), but also to replace the discrete component regulators designed by users. According to SGS the L 296 (the name of the regulator), should satisfy 90 percent of the requirements of the electronics industry in general. In the area of power electronics, it may help simplify regulators significantly.

Seventy-two Percent Efficiency at 100 kHz

The L 296 allows the design of chopping supplies capable of providing up to 4 amps at 5.1 to 40 volts. As an example, when providing 4 amps at 5.1 volts from 35 volts input, SGS claims that the efficiency is 80 percent at 25 kHz, 72 percent at 100 kHz, and 64 percent at 200 kHz (with the associated VSK 540 diode).

Under .5 amp, the efficiency drops to under 55 percent. In addition, SGS also claims typical line and load regulation figures of 20 mV and 15 mV respectively, in producing 5.1 volts from a 15-volt source.

The following is a list of some original characteristics which will help reduce the number or volume of external components:

--Operating frequency up to 200 kHz;

--integrated load-current detection resistor;

--integrated inference voltage adjusted to 2 percent using the Zener zap technique;

--programmable slow voltage rise;

--programmable current-limiting capability; thermal protection;

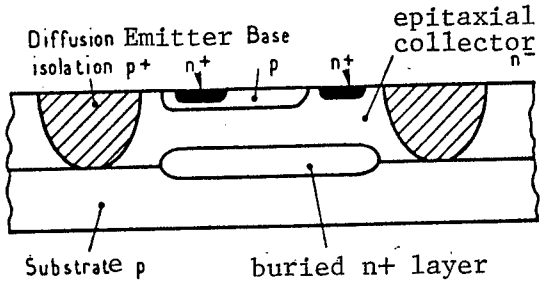
--availability of a timed signal on the reset output when the voltage reaches a preset threshold;

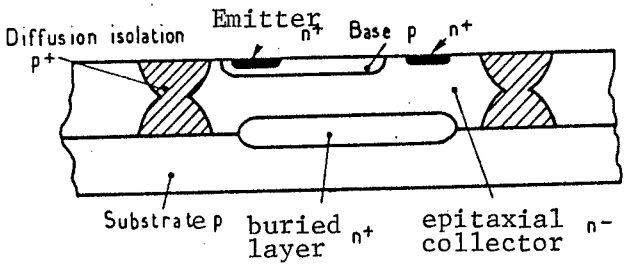
--timing and threshold can both be programmed using external components, which provides the capability to monitor the input or output voltage;

--"crowbar" type overload protection available by adding an external SCR. The L 296 then provides the required voltage detection and control circuitry;

--several L 296 circuits may be synchronized, and remote control may be simplified by the use of the TTL-compatible inhibit input.

The L 296 is packed in a 15 I/O pin multiwatt plastic package.





[Box, page 24]

A 50 V, Bipolar Technology

The L 296 uses a recent bipolar technology which facilitates the integration of power semiconductors and other circuits on the same chip while being capable of withstanding 50 volts. The originality of this technology is in the implementation of double ion implantation to produce the lateral isolation wells.

Isolation is usually achieved by diffusing p^+ type impurities into the upper n^- epitaxial layer. But the high temperature required in the process tends to spread the buried n^+ layer, and thus lower the voltage characteristics. SGS has thus developed isolation obtained in two steps through ion implantation before and after the production of the epitaxial layer, with the second implantation being followed by heating so that the two implantations may diffuse and connect to one another. The isolation is thus finer, and SGS claims that the voltage characteristics are improved because the buried layer diffuses less. The structures being smaller, the circuits are also faster.

6445
CSO: 3698/172

BRIEFS

SIEMENS COMPETITIVE INTEGRATED MOS--Thanks, among other things, to the use of submicron technologies, SIEMENS introduced in the United States last August, a family of MOS integrated circuits on 8 mm^2 chips whose characteristics are identical to those of the MOS 16 mm^2 chips, which provides them with the capability of offering unbeatable prices. Thus, in the United States, the BUZ 71A, 50v/0.12 Ohm is available at a price of $1.25 in quantities of 100, the BUZ 72A, 100v/0.2 Ohm at $2.00, the BUZ 73A, 200v/0 Ohm at $2.00, the BUZ 76, 400v/1.8 Ohm at $2.19, and the BUZ 74, 500v/3 Ohm, at $2.89. This evolution confirms the theory's prediction: the potential progress in the low-voltage area (under 100 volts) is very important still, and involves several orders of magnitude in comparison with the 1978 MOS. On the other hand, in the high voltage area (over 400 volts), progress is measured in percent. Already, the voltage characteristic of the BUZ 74 is 10 times that of the BUZ 71A, and the resistance is multiplied by a factor of 25. [Text] [Paris ELECTRONIQUE DE PUISSANCE supplement to 9 Sep 83 of ELECTRONIQUE ACTUALITE in French p 5] 6445

CSO: 3698/172

OLIVETTI ESTABLISHES VENTURE CAPITAL FUND

Bern TECHNISCHE RUNDSCHAU in German 28 Aug 83 p 45

[Text] In the course of the summer months, the firm Olivetti S.p.A., Italy's largest computer science company, will establish a venture capital fund. There are now already about 200 venture capital funds with a usable capital of between $20 million and $60 million operating in the United States. According to statements by Carlo de Benedetti, Olivetti chairman of the board, there are plans for the future to put substantially more than $20 to $25 million annually into initiatives involving risk financing. The goal is to promote a number of innovative market niches around the concern so as to be able to maintain the prevailing strong growth in technological and marketing terms.

Heretofore, Olivetti is the only European enterprise that has made a deliberate effort to invest in venture capital fields in the United States. Since June 1980, interests were acquired in a total of 21 high-technology enterprises in computer science, and 7 of those acquisitions were in 1982. Six of those are quoted over the counter on the New York Stock Exchange. Olivetti is now receiving an average of five investment or financing offers per week.

At the same time that Olivetti itself is making deliberate efforts to maintain international standards and possibly even secure an advantage by way of risk-capital financing, there are parallel efforts to promote this sphere of investment financing in Italy as well. Olivetti took over the functions of a pace-setter with a venture capital congress in Venice at the end of June, in which for the first time more than 500 Italian bankers and financiers were made familiar with the various methods that are applicable in this area. Heretofore, there have been four venture capital companies in Italy, the firms Finnova, Lombardia Fincapital, Sofipa and Innovazione, all in Milan. But their importance is still not great. Venture capital activities in Italy are made more difficult by the fact that the second phase is lacking: the merchant banks. They are used for risk-capital financing in the United States or in England. These banks are still to be established in Italy, after a recent pronouncement in this direction by the Central Bank.

In principle, according to Olivetti chief Carlo de Benedetti, the structure of Italian enterprises and savings--numerous small and medium-sized companies with great vitality on the one hand and the highest savings rate from per-capita income in Europe on the other--does indeed present fertile ground for

innovation and capital transfers. But deficiencies in the second stage of financing and difficulties in the case of new listings make practical implementation difficult.

Olivetti S.p.A. is registered to be listed on the New York Stock Exchange in 1984. Ducotel Olivetti Corp., its U.S. subsidiary, has been listed there since 1982.

9746
CSO: 3698/180

SCIENTIFIC AND INDUSTRIAL POLICY

GOALS, FUNDING OF 'PUCE' PLAN FOR PROMOTING MICROELECTRONICS

Paris ZERO UN INFORMATIQUE HEBDO in French 5 Dec 83 p 11

[Interview with Jean-Claude Hirel, head of DIELI [Directorate of the Electronic Industry and Data-Processing]; date and place not specified]

> [Text] On the occasion of the Electronic Components Show, Mr Fabius, minister of industry and research, announced the start of the PUCE Plan: Products Using Electronic Components. Jean-Claude Hirel, director of electronic industries and data-processing clarifies the objectives and mechanism of the PUCE procedure, which is to be implemented by DIELI.

[Question] Why a program to encourage the use of microelectronics?

[Answer] As all experts will tell you, in the past few years considerable revolutions have taken place in the technology of integrated circuits. Progress have been made in four directions: size reduction, cost reduction, increased complexity of the logic architecture and improved processing speed, improved reliability of operation.

These technical progress offer considerable possibilities in expanding the industrial applications of microprocessors.

A new technology has emerged: microelectronics. It is now invading production processes and products. No sector, not even the most traditional, and no company, not even the smallest, can remain indifferent to microelectronics.

In the past two decades already, many products were transformed by microelectronics: electromechanical telephone exchanges were replaced by electronic exchanges, office calculating machines by computers, slide rules by pocket calculators, spring and gear motors by electronic watches, etc.

Not only may traditional products be displaced by new products incorporating the new technologies, but microelectronics and its powerful applications may also generate products meeting entirely new needs. We can say that whenever an industrial product or equipment involves problems of outside data acquisition or regulation or display, etc., there is room for the introduction of

microprocessors, either in new applications or to replace traditional technologies, such as traditional, electromechanical circuits, etc.

Now, our economic environment is in a state of upheaval. New technologies, new competitors, new demands from the markets, which shorten product life: we must adapt or disappear, for our competitors will not wait.

The plan called PUCE, the acronym for Products Using Electronic Components, was designed to inform enterprises, especially small and medium-size enterprises, in traditional sectors, which may not always know that they, too, will be affected by microprocessors.

[Question] How does the PUCE Plan fit in with industrial policy objectives?

[Answer] The PUCE plan finds its place among the new orientations which the minister of industry and research, Mr Fabius, intends to give to the industrial policy: to stress industry modernization, especially in traditional sectors. Another expression of this orientation is the Factory Automation Plan which, for its part, deals with equipment used in manufacturing processes and potentially covers sectors employing 2 million people.

The objective of the PUCE Plan is to create a demand for integrated circuits among user companies. It is closely coordinated with the wide-ranging policy started in 1982 to develop the French integrated circuit supply, as well as with the passive component action program. We also expect the PUCE Plan to contribute to the development of microelectronics consulting companies [SSCMs]; In the past few years, DIELI initiatives have caused a large SSCM network to develop in most regions. These companies will play a crucial part in showing how integrated circuits can be used by small and medium-size enterprises, in analyzing the needs of these enterprises, and as middlemen in dealing with component manufacturers.

[Question] How will the PUCE Plan operate?

[Answer] The PUCE Plan will play a part at two stages in industrial decisions:

- In feasibility studies: Can the enterprise use microelectronics? What are its needs? What type of components does it need (what technology; standard or customized circuits)? What are the specifications? Aids representing two thirds of the cost of design studies, up to 70,000 French francs, can be obtained.

- Industrial implementation: aids of up to half the implementation costs, not to exceed 300,000 French francs, may be obtained.

DIELI product contracts may also be used for industrialization projects, in the case of larger products.

A decision was made to create an organization adapted to the requirements of small and medium-size enterprises, so they would have the benefit of a regional procedure. The enterprises will contact local offices of the Ministry of Industry and Research: the Regional Industry and Research Directorates (DRIRs),

which will be in charge at all stages of the procedures. Rapidity will be essential in deciding to allocate aids and in paying them (within two months of the application).

The DIELI will provide overall coordination, it will organize a network of experts, it will manage the information campaign at national level, in connection with the professionals involved; as part of the investigation carried out by the DRIRs, the DIELI will decide on the larger projects, within a committee including professional federations and organizations representing the sectors involved.

The PUCE Plan was officially started by Mr Fabius when he inaugurated the Electronic Components Show last 14 November. Several information brochures and application forms for aids can be obtained from the DRIRs, regional chambers of trade and industry, professional organizations and the DIELI.

Microelectronics Consulting Companies [SSCMs] (DIELI Investigation Covering 1981)

Table 1. Breakdown by 1981 Sales

	Sales in Million French Francs					
Item	Less than 1	From 1 to 5	From 5 to 10	From 10 to 50	Over 50	Total
Number of companies	14	15	8	2	1	40
Total sales	6	31.6	55.74	23.70	57	174
Percentage of sales	3	18	32	14	33	100

Table 2. Location

Regions	Percentage in Each Region
Paris area	23
Champagne-Ardennes-Picardy	5
North	13
Lorraine-Alsace-Franche-Comte	8
Normandy-Brittany-Loire area	9
Limousin-Auvergne	2
Poitou-Aquitaine-Midi-Pyrenees	5
Burgundy-Rhone-Alps	11
Languedoc-Roussillon-Provence	14
Others	10

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